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BLACKLOCK'S
TREATISE
ON
SHEEP.

38.

18.



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PLATE VI



Fig 1



Fig 2

A
TREATISE
ON SHEEP;

WITH
THE BEST MEANS FOR THEIR IMPROVEMENT,
GENERAL MANAGEMENT,
AND THE
TREATMENT OF THEIR DISEASES.

WITH
A CHAPTER ON WOOL,
AND
HISTORY OF THE WOOL TRADE.

By AMBROSE BLACKLOCK,
SURGEON, DUMFRIES.

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turned into gold."—SWEDISH PROVERB.

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TO
SIR C. G. STUART MENTEATH,
OF CLOSEBURN, BART.,
VICE-LIEUTENANT OF DUMFRIES-SHIRE. &c. &c. &c.
WHOSE INTEGRITY AND URBANITY
HAVE ENDEARED HIM TO SOCIETY;
AND
WHOSE ZEAL FOR THE IMPROVEMENT OF THE SOIL,
AND FOR THE PROSPERITY OF THE FARMER,
HAVE RAISED HIM, BY COMMON CONSENT,
TO THE FIRST RANK
AS AN AGRICULTURIST, AND AS A LANDLORD;
THIS TREATISE ON SHEEP
IS RESPECTFULLY DEDICATED,
BY HIS VERY HUMBLE SERVANT,
THE AUTHOR.

P R E F A C E.

THE truth of the Greek proverb, that "*a great book is a great evil*," is no where more apparent than in the construction of works on agricultural concerns. Those who have attended to the subject well know, that the profitable management of live-stock is by far the most difficult branch of farming, as it is here that improvement is peculiarly tardy; and from this we might infer that authors would endeavour so to arrange and simplify their treatises as to enable every one to obtain the bearings of the study at the smallest possible expense and trouble. Such, however, is not the case. Many would appear to have done their best so to dilute and mystify the little which is known about the matter, that it is nearly impossible for any one, not gifted with more than ordinary power of application, to arrive at any thing like just conclusions. To avoid this error has been my object in the following pages. Such points only as are of real importance have been

noticed; every thing having been rejected which could not admit of a practical application. For this reason, also, I have omitted all allusion to foreign *varieties* of the sheep, an account of which is, in some similar works, made to occupy so large a space. The general laws by which animal bodies are governed, and the changes to which they are rendered liable by their subserviency to man, are here—and for the first time as regards the sheep—gone into at considerable length. Too little value is in general attached to such inquiries; though, when endeavouring to improve a domesticated race, we must be perfectly aware, that without this species of knowledge we are like a ship at sea without the guiding aids of the rudder and the compass, and liable to be carried in the right or in the wrong direction only as chance directs.

In conclusion, I need make no apology for any defects that may appear in this little work, having done my best to make it useful to the farmer.

CASTLE STREET, DUMFRIES,
July, 1838.

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Fig. 2. and 3. p. The first stomach or paunch ; *b.* the second stomach, bonnet, king's-hood, or honey-comb ; *o.* the third stomach, or omasum ; *a.* the fourth stomach, or abomasum ; *g.* the gullet ; *py.* the pylorus.

Fig. 4. Section of a sheep's toe ; *g. g.* the gland secreting the hoof ; *c. c.* the crust ; *s.* the sole.

Fig. 5. View of the interdigital gland ; *g.* the gland ; *d.* the duct leading from it.

Fig. 6. The fluke-worm ; *a.* the mouth ; *b.* the reproductive apparatus ; *c. c.* vessels for the distribution of the blood.

PLATE II.

Fig. 1. Dorsetshire Ram.

Fig. 2. South Down Ram.

The figures in this plate are borrowed from the beautiful cuts in the work on *Sheep*, published by the Society for the Diffusion of Useful Knowledge.

THE SHEEP.

CHAPTER I.

HISTORY OF THE SHEEP.

(1.) *Origin of the Sheep.*—As the origin of our domesticated animals has afforded scope for much curious speculation, so none have attracted a greater degree of attention in this respect than the sheep. Into these arguments, however, it would be absurd to enter ; I shall therefore content myself with such opinions as are deemed the best.

Placed in the Class Mammalia, and Order Ruminantia, the innumerable varieties at present existing may, according to Cuvier, whose tact in arranging animals is universally acknowledged, all be referred to four species—the Argali of Siberia, the Mouflon of Sardinia, the Mouflon of America, and the Mouflon of Africa—though to be rigidly accurate in natural distinctions, he would refer them all to three, thereby excluding the third.

(2.) *The Argali of Siberia* (*Ovis Ammon*) inhabits the mountains of Asia, where it attains the size of a fallow deer. The male has very large horns, with three rounded angles at the base, flattened in front, and

striated transversely. The horns of the female are compressed, and hook-shaped. The hair is short in summer, and of a fawn-coloured grey; in winter it is thick, rigid, and of a reddish grey, with some white about the muzzle, throat, and under the belly. The Mouflon of Sardinia (*Ovis Musimon*, Fig. 1. Pl. I.) differs from it only in its inferior size, and in the smallness of the horns of the female.

(3.) *The Mouflon of America* (*Ovis Montana*) closely resembles the Argali, and is supposed by some to be identical with it, and to have crossed from Asia to America at Behring's Straits by means of ice.

(4.) *The Mouflon of Africa* (*Ovis Tragelaphus*) is distinguished by its soft and reddish hair, by its short tail, and by a long mane hanging under the neck, and another at each ancle; it inhabits the rocky districts of Barbary, and has been observed in Egypt.

(5.) *British Breeds*.—The breeds of our island, as they at present stand, may be divided into two kinds—long-woolled and short-woolled; the former embracing the Lincolnshire, the Teeswater, the Dishley, or New Leicester, and the Devonshire Nots; while the latter will include those of Dorset, Herefordshire, and Sussex, with the Cheviot, Mugg, and Black-faced variety.*

(6.) *The Lincolnshire* has no horns; the face is white; the carcass long and thin; the legs thick, white, and rough; bones large; pelts thick; and the wool from 8 to 10 inches in length. The ewes weigh from 14 lbs. to 20 lbs. per quarter; and three-year old wethers 20 lbs. to 30 lbs. The fleece weighs from 8 lbs. to 14 lbs.,

* *Encyclopædia Britannica*, 7th Edition, Article Agriculture.

and covers a coarse-grained slow-feeding carcass ; so slow, indeed, at feeding, that it cannot be fattened at an early age, except upon rich land ; but the breed is encouraged, from the great weight of wool that is shorn from them every year. It and its sub-varieties are extremely common in the English counties.

(7.) *The Teeswater* sheep were originally bred from the same stock as the former, but have become different, from the size having received greater attention than the wool, which is inferior both in length and weight. They stand upon higher and finer boned legs, which support a firmer and heavier carcass, much wider upon the back and sides, and afford a fatter and finer-grained mutton—the two-year-old wethers weighing from 25 lbs. to 30 lbs. per quarter. Marshall, in his work on Yorkshire, remarks, that they are not so compact, nor so complete in their form, as the Leicestershire sheep ; nevertheless, the excellency of their flesh and fatting quality is not doubted, and their wool still remains superior. For the banks of the Tees, or any other rich fat land, they are singularly excellent.

(8.) *The Dishley, or New Leicester*, is distinguished from other long-woolled breeds, by clean heads, straight broad flat backs, round bodies, small bones, thin pelts, and a disposition to fatten at an early age. But more of this hereafter. The weight of three-year-old ewes is from 18 lbs. to 26 lbs. per quarter ; and of two-year old wethers from 20 lbs. to 30 lbs. The wool averages from 6 lbs. to 8 lbs., and is thought by some to be inferior in quality to that of Cheviot sheep ; but, from being fully fed at all seasons, they yield great quantities of it. Fig. 1. Pl. III.

(9.) *The Devonshire Nots* form the fourth hornless variety of long-woolled sheep. Forty or fifty years ago, they ranked as middle-woolled sheep; but they now figure among the long-wools, under the name of Bampton—*their fleece having been lengthened, and rendered finer, by crossing with the Leicesters.* There is yet, however, much room for improvement in these crosses. They have white faces and legs, the latter being short, and the bones large, while the necks are thick, the backs high, and the sides good. They approach in weight to the Leicester, but the wool is heavier and coarser. In Devonshire are found a white-faced and horned variety, which are known as the Exmoor kind, from the place of their nativity. Though delicate in bone, they are not good, having a narrow flat-sided carcass; while the weight of the quarters and fleece is a third short of the former variety.

(10.) *The Dorsetshire sheep* are horned and white faced, with a long thin carcass, and high small white legs. Three-year-old wethers weigh from 16 lbs. to 24 lbs. a quarter; but the wool, being fine and short weighs only from 3 lbs. to 4 lbs. a fleece. It is, however, amply compensated for by the mutton, which is of superior quality. The peculiar and most valuable property of this breed is the forwardness of the ewes which take the ram at any period of the year, after lambing, so early as September or October. They are on this account, extremely useful for supplying large towns with house-lamb at Christmas. Fig. 1. Pl. II.

(11.) *Herefordshire or Ryeland sheep* have white legs and faces, and no horns. The wool grows close

to the eyes. They are a small breed, suited to every market, weighing from 12 lbs. to 16 lbs. a-quarter. The carcass is tolerably well-formed, and the wool fine and short, each fleece weighing from $1\frac{1}{2}$ lb. to $2\frac{1}{2}$ lbs., rarely, however, exceeding 2 lbs. They were called *Ryeland* sheep, from a district in the southern part of Herefordshire being thought capable of growing nothing but rye. Though their figure is good, the back is not so level, nor the ribs so well rounded, as in the improved breeds. They fatten easily, however, and arrive soon at maturity, though reckoned inferior in these respects to the Cheviot variety.

(12.) *The South Down*, like the *Ryeland*, are, from the delicacy of their constitution, unadapted for bleak situations, but sufficiently hardy and active for a low country; their average weight is from 15 lbs. to 18 lbs. a-quarter; that of the fleece, which is very short and fine, being from $2\frac{1}{2}$ lbs. to 3 lbs. They are without horns, have grey faces and legs, a neck low set and small, and a breast neither wide nor deep; their mutton is fine in the grain, and of an excellent flavour, having been brought to great perfection by Mr Ellman of Glynd, and other intelligent breeders. They are mostly found in Sussex, on dry chalky downs producing short fine herbage, and arrive early at maturity; in which respect they are equal to the Cheviot, though inferior to them in quantity of tallow. Formerly they would not take on fat till four years old; now they are always at market when about two years of age, and many are killed before that period. Fig. 2. Pl. II.

(13.) *The Cheviot Sheep* have a bare head, with a long jaw, and white face, but no horns. Sometimes

they have a shade of grey upon the nose, approaching to dark at the tip; at others, a tinge of lemon colour on the face, but these markings scarcely affect their value. The legs are clean, long, and small-boned, and covered with wool to the hough; but there is a sad want of depth at the breast, and of breadth both there and on the chine. A fat carcass weighs from 12 lbs. to 18 lbs. per quarter, and a medium fleece about 8 lbs. The purest specimens of this breed are to be found on the Scotch side of the Cheviot hills, and on the high and stony mountain-farms which lie between that range and the source of the Teviot. These sheep are a capital mountain stock, provided the pasture resembles the Cheviot hills, in containing a good proportion of rich herbage. Fig. 2. Pl. III.

(14.) *Mugg Sheep*.—"In this variety," says Dr Fleming, in his History of British Animals, "the face and legs are white, or rarely spotted with yellow, and the forehead covered with long wool. This is the native breed in Scotland, to the north of the Forth and Clyde. They are of small size, and seldom weigh above 8 or 10 lbs. per quarter. Some tribes have horns; others are destitute of them, and they vary in the length of the tail. They may be considered as the stock of the numerous modern and valuable varieties, which are bred in the best cultivated districts. The Shetland sheep belongs to this kind. The fur consists of firm wool next the skin, with long coarse hairs, indications of an inhabitant of an arctic climate."

(15.) *The Black-faced or Heath Sheep* are known by their large spiral horns, wild-looking eyes, black legs and faces, with short firm carcasses, covered by

long coarse wool, which weighs from 3 lbs. to 4 lbs. As the form of this sheep has lately been much improved, by inducing a short and round carcass, they have acquired the name of *short* sheep, in contradistinction to the Cheviots, which are termed long sheep. When three years old, they fatten well, affording excellent highly-flavoured mutton, and weighing from 10 lbs. to 16 lbs. a-quarter. They are the most valuable upland sheep in Britain, abounding in all the western counties of England and Scotland, and are now becoming great favourites in the London market. Fig. 1. Pl. IV.

(16.) *The Merino*.—Though many foreign breeds have from time to time appeared in this country, yet almost all of them have been viewed merely as objects of curiosity, and, as such, have speedily been disregarded. Far different, however, was the reception of the Merinos. Brought into England under the most favourable auspices, and placed at once under the fostering protection of royalty, their native merits could not but be speedily appreciated and diffused throughout the kingdom. They have received the name of *Merino* from a peculiar buff or reddish hue of the countenance, and are supposed to have come originally from Africa; at least Marcus Columella, having seen a strange variety from that country exhibited at Rome, during some public games or shows, took them to his farm, and, having crossed them with the breeds of Tarentum, sent the offspring to Spain. There they thrived remarkably, attracting the attention of other nations, to whom they were from time to time exported, and at present may be found in almost every part of the world.

Merinos were brought to England for the first time in

1788, but attracted little attention, owing to the want of rams. Lord Somerville went to Portugal in 1801, for the purpose of selecting such animals as appeared valuable, from uniting a good carcass with a superior fleece, and he succeeded, notwithstanding the disturbed state of the country, in obtaining specimens, which called forth the praises of the shepherds, through whose travelling flocks they passed. Public attention was attracted to them on the commencement of his Majesty's sales in 1804; and their distribution over the country was accomplished in 1811, by the formation of the principal landed proprietors and eminent breeders into a Merino Society.

The Morinos had much prejudice to encounter on being first brought before the public in 1804; but they soon rose in favour and value, and steadily progressed till the Merino Society was established, when, strange though it may appear, all these advantages were at once destroyed. This paradox may, perhaps, be explained, by supposing that the institution of local committees, which immediately followed, allowed the enemies of the change, in distant parts of the kingdom, ample opportunity of striking at the scheme, now that it was entrusted, in many instances, to persons ill qualified for the task either of making converts, or retaining the advantages already gained.

The horns of the Merino are of large size, twisted spirally and extended laterally, approaching closely in these characters to the sheep of Mount Parnassus, a specimen of which is delineated in the work by E. T. Bennett, on the Gardens and Menagerie of the Zoological Society. *The face has a characteristic velvety appear-*

ance, but the cheeks and forehead are disfigured by coarse hair. The legs are long and small in the bone; the breast and back are narrow, the sides flat, and too much of the weight is expended on the coarser parts. There is a peculiar looseness of skin beneath the throat, which is admired in Spain as denoting a tendency to weight and fineness of wool, though regarded in this country as a sign of a bad skin and want of aptitude to fatten. The average weight of the fleece in Spain is, 8 lbs. from the ram, and 5 lbs. from the ewe. The abundance of the yolk enables the wool to detain all the filth which comes in contact with it, so much so, that by washing the weight is diminished about three-fifths. The fibre of the wool is finer than that of any other sheep, and the carcass, when fat, averages from 12 lbs. to 16 lbs. a-quarter. They are quiet and tractable, and possessed of many good qualities, but they are liable to abortion, are bad nurses, and require a large supply of food, for which, owing to an unprofitable form, they yield no return. Fig. 2. P. IV.

The Merinos were at one time in great request in various countries, from a supposition that they would speedily supplant other breeds; but this has never been the case, as the animal soon degenerates when out of Spain, and is only valuable so far as giving rise to varieties, which are equal, if not superior to itself. Large profits were at first expected from their wool, but these were reduced to a trifle when the loss of weight, and fineness in the carcass were taken into account. Mr Hose of Melton Mowbray, put a certain number of Leicester ewes to a ram of the same breed, and an equal number to a merino ram. The result

was, that the Leicester fleece weighed 7 lbs., and the one from the cross with the merino, 8 lbs.; and that the former brought in the market 1s. per lb., and the latter 1s. 6d., being a gain of 5s. on the fleece. The carcass of the former, however, weighed 27 lbs. per quarter, and the latter only 25 lbs., being a loss of 5 lbs. on mutton. Much advantage may, however, be expected from our crosses with the Saxon merino, which is in every respect well suited to our notions of a fine animal, as it yields a good wool, and is little inferior in carcass to some of our best breeds.

(17.) *Teeth of Sheep*.—In common with the rest of the ruminating animals, sheep have eight incisors in the lower jaw, unopposed by any in the upper, a callous pad, which is substituted, being attached to the distal end of the intermaxillary bones. Between the incisors and molars, or grinding teeth, there is a vacant space of about an inch and a half. There are twenty-four molars, six on each side of each jaw; their crowns are marked with two double crescents, the convexity of which is turned inwards in the upper, and outwards in the lower jaw. The lamb, when newly dropped, is devoid of incisor teeth, though the two central ones are occasionally above the gum even at this early period. When one month old, the first set of incisive teeth are complete. The two fore-teeth of the under jaw drop out at the end of the first year; six months after the two next to these are lost; and at the end of five years the teeth are all renewed. When the permanent teeth are fully grown, it is almost impossible to ascertain the age of the animal, as the soil, the texture of the provender,

and the original form of the teeth, have all a greater or less influence over their durability.

(18.) *Distinctions between the Sheep and Goat.*—Though a comparison of the most common domesticated breeds of sheep and goats, tends to confirm the broad distinctions drawn between them, yet these differences almost entirely disappear, when we attempt to define the characteristics of those races, which still exist in a wild state in various parts of both Continents, where it is so far impossible to determine the precise division to which they belong, that Cuvier holds them unworthy of a generic separation. Sheep and goats, in fact, agree in so many points as regards structure, form, stature, and habit, that were it not that sheep, according to that naturalist, have “their horns directed backwards, returning more or less forwards in a spiral manner, with a generally convex line of profile, and no beard,” while the goats have “their horns directed upwards and backwards, their chins generally decorated with a long beard, and their line of profile almost always concave,” there would hardly exist a difference worth the noting. Some writers place great reliance on the differences indicated by the different coverings of the animals, ascribing wool to the sheep, and hair to the goat, forgetting that most of the wild sheep, and some of the domesticated races, are covered with hair, while some goats, as those of Thibet and Angora, are remarkable for the fineness of their wool. Even supposing these distinctions to hold good, we have still to combat the fact, that *sheep and goats produce mongrels capable of reproduction*, a consideration sufficient of

itself to prove, that the sheep and goat can never be made to form the types of separate genera.*

(19.) *Horns of Sheep*.—As the Chevrotains or Musks are distinguished, with the Camels, from other animals of this order by the absence of horns, so are sheep, oxen, goats, and antelopes, distinguished from the rest of the horned genera of the order, by the persistence of their frontal prolongations. The horn is an elastic sheath of *agglutinated hairs*, which appears within the first twelve months, though sometimes present at birth, and increases by layers, one being added every year, so that the age of a ram may be known by the number of rings. The ewes have commonly no horns, but only a protuberance in place of them. The horn is supported by, and serves to cover, a highly vascular prolongation of the frontal bone, and it is at its root, where large vessels, and nervous filaments are entering, that blows occasion so great agony to the animal, apart from the damage which the other bones sustain by the infliction of violence on so powerful a lever.

(20.) *Structure of the Stomach*.—The term ruminating, indicates the power possessed by this animal, in common with many others, of masticating its food a second time, by returning it to the mouth after a short maceration. This they are enabled to do, from the structure of the stomachs, or, more correctly speaking, stomach; as anatomists have now concluded, from all animals being constructed on one common principle, that ruminating animals are not possessed of four

* For further information on this subject, see that excellent paper on the Natural History of the Sheep and Goat, by James Wilson, Esq. in *No. IX. of the Quarterly Journal of Agriculture*.

stomachs, as formerly supposed, but only of one, which they view as being divided into four compartments. In drawing precise conclusions, we are bound only to admit the existence of two compartments, the other two belonging properly to the gullet; and being equivalent to the cheek pouches of monkeys, or the crop and membranous stomach of birds, may be viewed as an apparatus designed to serve a nearly similar purpose (that of moistening and macerating the food); while the real stomach will cease to excite wonder, or puzzle the ignorant, on being contrasted with that of other animals, in many of which a division exists, and from which even the human stomach, though generally a single sac, is not always exempt,—Dr Knox, of Edinburgh, being in possession of one that resembles a pair of small globes joined by a narrow tube, and which, when taken from the body of a person who was advanced in life, bore every mark of soundness in texture, and must, therefore, have been congenital.

(21.) *Digestion*.*—The food descends by the gullet after being partially crushed, into what is called the first stomach, or paunch, in Latin, *rumen*, or *ingluvies*, in which cavity are found those morbid concretions so much, and so superstitiously, prized in the Eastern world, under the name of Bezoar stones; from this it passes into the second, termed bonnet, king's hood, or honey-comb, in Latin *reticulum*, which is much smaller than the other, and receives its name from the inner coat being arranged into cells; here it is moistened, made into pellets, and, while the animal is at rest, impelled by the antiperistaltic motion of the tube to

* See Figs 2 and 3, Plate I, with their references.

the mouth, and after undergoing a complete mastication, is returned through the gullet to the third stomach, or smallest compartment, which goes under the name of *omasum*, or many-plies, from its resembling a rolled up hedgehog, and sometimes from the longitudinal *laminae* of its mucous membrane that of leaflet. The food remains but a short time in the omasum, proceeding into the fourth division, or *obomasum*, which in its structure, especially in that of the mucous, or inner membrane, is nearly allied to the same organ in the human being, and is, by the French, from its power of coagulating milk, called *caillette*. The last compartment is the largest of the four, so long as the animal continues to live on milk; but the paunch speedily surpasses it in magnitude when grass becomes the sole provision. The milk always passes at once into the fourth stomach, there being no reason why it should be returned.

The intestinal canal is long, commencing at the pylorus or lower opening of the stomach, and averaging from ninety to one hundred feet. There are but few enlargements in the great intestines. The fat, like that of all ruminating animals, becomes, on cooling, hard and brittle.

(22.) *Period of Conception*.—In this climate, ewes fed on good pastures admit the ram in August; but September or October is the time when such would occur if left to nature. They go with young five months, and in warm climates bring forth thrice a-year; but in Britain, France, and most of Europe, they do so *only once*. They give milk for seven or eight months; *live ten or twelve years*; and if well managed, are

capable of bringing forth during life, though generally useless for that process after the seventh or eighth year. The ram lives from twelve to fourteen years, though instances are recorded of their enduring till twenty, and becomes unfit for propagating at eight.

(23.) *Names applied to Sheep.*—The age of sheep is never dated from the time that they are dropped, as that would be attended with many inconveniences, but from the time that they are first subjected to the shears, by which means the first year includes a period of at least fifteen or sixteen months.

The following is a condensed arrangement of the names by which sheep are designated at different periods of their existence, in various parts of England and Scotland :—

From Birth till Weaning.

MALE.

FEMALE.

Tup, Ram lamb, Heeder, Pur. | Ewe or Gimmer lamb, Chilver.

From Weaning till first Clip.

Hog, Hogget, Hoggerel, Teg.	Gimmer hog, Ewe hog, Teg. Shee- der ewe, Thrave.
Lamb hog, Tup hog, Gridling,	
and, if castrated, a Wether hog.	

From first to second Clip.

Shearling, Shear hog, Heeder,	Shearing ewe or gimmer, Double- toothed ewe or Teg, Yill gimmer.
Diamond or Dinmont ram, or	
tup, and, when castrated, a	
Shearing wether.	

From second till third Clip.

Two shear ram, young wedder. | Two shear ewe, Counter.

From third till fourth Clip.

Three shear ram, old wedder. | Three shear ewe, Fronter.

And so on, the name always taking its date from the time of shearing. Broken-mouthed ewes are called *crones* in Suffolk and Norfolk; *kroks*, or *crocks*, in

Scotland ; and *drapes* in Lincolnshire. In Scotland, ewes which are neither with lamb, nor giving milk, are said to be *eild*, or *yield*.

CHAPTER II.

WOOL.

(24.) *Wool-Bearing Animals*.—In most dictionaries wool is defined as the fleece of sheep, as if, in fact they were the only animals which yield it, than which nothing can be more erroneous ; since we are assured by the ablest naturalists, that almost every animal, from the butterfly up to man, possesses more or less of this covering, and that some indeed rival the sheep in the quantity they bear.

Though wool is possessed in considerable quantity by carnivorous animals, especially bears, yet the herbivorous quadrupeds, never to mention the sheep, are principally noticed for its growth, and for affording a commodity which becomes an article of profit in the hands of some tribes. Heriot, in his travels through Canada, remarks, that “the savage women manufacture thread of the wool of the buffalo, and weave it into cloth. Most parts of the body are invested with a dusky wool, which is of a quality extremely fine—is much valued—and can with great facility be used in manufactures. The quantity usually contained on one skin is about eight pounds.”

So far from the sheep being invariably a wool-bearing creature, it would appear as liable to be entirely

destitute of it as some other animals ; for in Tartary, the eastern parts of India, China, and some parts of Africa, a hair of varying quality forms their sole covering ; and Sir Joseph Banks imported three from Spain, which were smooth, sleek, and as short-haired as a horse.

(25.) *Structure of the Skin*.—The skin is composed of three coats, or layers ; the outermost, the cuticle or scarf-skin, is a thin delicate membrane, devoid of feeling, and of a scaly texture, pierced by innumerable small holes, for the passage of the hairs, and perspiration, and covering the next, or mucous coat, so named from its pulpy appearance. In this resides the colouring matter, which imparts its peculiar tints to the hair, and which can only be satisfactorily demonstrated in the dark races. The existence of this coat has been by some denied ; but it is probable that, though present in all, it can only be exhibited in such as have depth of tint, to admit of the display. It is here that sensation principally resides ; the nerves, or rather their terminations, ramifying minutely in its substance, at which they have arrived by piercing the third tunic, or true skin, a dense firm elastic membrane, in which the roots of the hairs are imbedded, and from which, in fact, they take their origin.

(26.) *Sebaceous Follicles*.—The skin is studded over by small glands, or what, in anatomical language, would be called sebaceous follicles, which vary in number in different breeds, and different parts of the body, being most numerous on the breast and shoulders, and secreting a peculiar unctuous semi-solid matter, which, as we shall immediately see, possesses alkaline properties.

(27.) *Connection of the hair with the skin—Yolk.—*

A hair implanted in the skin may be compared to a plant growing in a flower-pot which has been sunk in the earth, as the root of the hair does not rise directly from the true skin, but from a little cup extending from it to the cuticle, and receiving nourishment from surrounding vessels. After coming to the surface of these tunics it has, in the sheep, yet another, and, in some respects, remarkable covering to pierce, one which has occupied the attention of the most distinguished chemists, and given rise to a good deal of disputation on the subject of salving—we allude to the Yolk. It is supposed by many to be the inspissated secretion of the sebaceous follicles, and receives its name from its adhesiveness and colour. It is most plentiful on fine-woolled sheep, those of the south possessing more than those of the north of our island, while merinos possess most of all ; so that there is apparently some connection between a fine fleece, and a good supply of this matter. According to the analysis of M. Vauquelin, it consists principally of a soapy matter, with a basis of potash ; a small quantity of carbonate of potash ; a minute quantity of acetate of potash ; lime in an unknown state of combination ; and an atom of muriate of potash. It owes its odour to a small quantity of animal oil, and is in every respect a true soap, which would permit the sheep to be completely washed in a stream, but for the existence in the fleece of an uncombined fatty matter, which remains attached to the wool, and renders it rather glutinous.

Many have tried to account for the uses of the Yolk, *but nothing* like satisfactory conclusions have been

come to : some considering it goes to form the filament, and is consolidated into a transparent mass while the pile is growing ; while others argue, that it is a peculiar secretion which exudes through the skin, and by mixing with the pile renders it soft and pliable, affecting it in the way that oil does a piece of leather. In the latter opinion I coincide. For my part, I view it as a secretion, depending very much on good food and steadiness of temperature, and, therefore, indicative of a fine fleece only so far as the health of the animal is concerned. In the human being the state of the skin may often guide us, though blind-fold, to the quality of the hair, so that the latter may be pronounced either dry and coarse, or glossy, soft, and silky, as the skin may prove either harsh and ungrateful, or pleasant, and, if I may be allowed the expression, alkaline to the touch. Every thing having a tendency to affect the health may always be considered as calculated to diminish this secretion, and, consequently, to deteriorate the quality of the wool.

The relative positions of the layers of the skin, the mode in which the hairs rise from them, and the form and situation of the sebaceous follicles, will be better understood by referring to the following cross section Fig 5. Pl. V., in which the line marked

- a* Represents the cuticle,
- b* The mucous layer,
- c* The true skin,
- d* Sebaceous follicles,
- e* Hairs rising from the true skin and inflections of the upper layers and piercing,
- f* The thin film of the yolk.

(28.) *Periodical decidence of Wool.*—It is affirmed that the only real difference between hair and wool is

in the latter falling off periodically; but the same change takes place in animals totally covered with hair; in fact, almost every animal is subject to moulting, or a periodical decidence of its protecting covering. The fleece of the sheep has been proved in many instances not to be liable to *annual* changes of this description;—Lord Western having, among others, shown that the wool of the merino may be retained at least three years without the slightest disposition to separate.

The annual employment of shearing, to anticipate this falling off of the wool, is now common in most parts of the world; yet some, as the Icelanders and Kamtschadales, still retain the primeval custom of *rowing*, or pulling off the fleece in a mass, about the end of May, at which time it is nearly loosened. This loosening of the attachments of the fibre is supposed to be owing to a diminution, during winter, of the nutritive process at the root of the hair, so that the fibre is liable to give way at the tender part when the fleece becomes heavy during Spring. This attempt at an explanation meets, however, with the insurmountable objection, that long-woolled are less liable than short-woolled sheep to this occurrence, a circumstance which ought to be the reverse, if weight had any thing to do in the case.

(29.) *Falling off of Wool prevented by Clipping.*
—Clipping has a curious influence over the duration of the covering of animals, as is well exemplified by the correct popular idea, that the only way to prevent the hair of children dropping off (as it sometimes has a *tendency to do*) is to cut it short: we may suppose the

benefit in this case to result from the removal of a *portion* of each hair, which, if allowed to remain, would lead to a sacrifice of the *whole*, by robbing the root of a quantity of nutritious matter, which, owing to a diminution of reproductive power, it could ill afford. In this way only can we account for the power which shearing evinces, in putting a stop to the attempt sometimes made by nature to change the coverings of some sheep. In the valley which separates the most eastern chain of the Cordilleras from the central, the wool grows upon the lambs in the same manner as in temperate climates, provided they are sheared so soon as it has arrived at a certain thickness ; in which case the wool grows again, preserving the same order. But, if the period for denuding the animal be allowed to pass, the wool detaches itself in flakes, leaving behind a short, glossy, and compact hair, exactly resembling that of the common goat in the same climate.

(30.) *Form of woolly fibre.*—The fibre of wool is circular, differing in diameter in the various breeds, and different parts of the same fleece. The following *à propos* observations are from the article on the Sheep, in the Library of Useful Knowledge : “ The filaments of white wool, when cleansed from grease, are semitransparent ; their surface in some places is beautifully polished, in others curiously encrusted, and they reflect the rays of light in a very pleasing manner. When viewed by the aid of a powerful achromatic microscope, the central part of the fibre has a singularly glittering appearance. Very irregularly placed minuter filaments are sometimes seen branching from the main trunk, like boughs from the principal stem. This exterior

polish varies much in different wools, and in wools from the same breed of sheep at different times. When the animal is in good condition, and the fleece healthy, the appearance of the fibre is really brilliant ; but, when the sheep has been half starved, the wool seems to have sympathized with the state of the constitution, and either a wan pale light, or sometimes scarcely any, is reflected."

The more transparent the filament the better is the fleece, and its value is impaired by the transparency being different in the same fleece, or, as often happens, in the same filament ; while that which possesses fineness with a close ground, pureness, elasticity, colour, tenacity, and not much pitch-mark, is the most esteemed, and preferred by the manufacturer. Wethers have considerably more wool than ewes. In every fleece there are several qualities, even so many as nine different sorts, which are all separated from each other in England by men called woolstaplers, who are appointed for the purpose, and sworn to do justice between the grower, and the merchant or manufacturer. In this manner the latter obtains, without trouble or risk, the very kind which he knows will suit his purpose ; for though the sorter, surrounded by a number of baskets, divides the wool according to its properties without the slightest hesitation, and with a rapidity truly surprising, yet such is the amount of the dexterity acquired by practice, that a mistake seldom occurs, and his judgment can as rarely be disputed.

(31.) *Structure and properties of Hair and Wool.*
—Each hair is composed of a number of filaments, or *smaller hairs*, ranged side by side, and this we can per-

ceive without the slightest trouble, from the tendency it sometimes has to unravel at the apex ; and again, by drawing a hair through the fingers from point to root, when we feel a roughness occasioned by projecting filaments, which only proceed a certain distance up the trunk, the longest being most internal.

Pl. V. Fig. 5, *e*, exhibits those points in a hair considerably magnified.

These projections, or serrations, which vary in number in different specimens of wool, are what it depends on for its felting properties. They are sharper and more numerous in felting wools than in others, and the better the felting properties of the wool, the more numerous the curls ; because what induces curling on the animal's back leads to felting in the hands of the manufacturer. In felting, these projections catch one upon another, and occasion the hair to move in one direction, which is invariably root foremost, as we perceive on giving it a twirling motion between the finger and thumb ; and it is only by the union of curve and serration, that felting can be accomplished certainly and perfectly.

Woolly fibre consists of a semitransparent stem, or stalk, supposed to be hollow, as represented at Fig. 4, Pl. V. and is partly distinguished from hair by the latter being opaque. Next to soundness, there are few qualities deserving of so much attention as softness, of which the ancient writers make frequent mention, and for the prevalence of which in our present wools fashion has done not a little. It is a quality that tends, in a material degree, to the cheap and easy working of the cloth, and, as such, is said to render wool 25 per cent. more valuable to the manufacturer than a harsh and brittle pile. It apparently

depends on the fineness of the fibre, which should not, however, go the length of weakness. Fineness is in turn mainly connected with the yolk, the secretion of which ought, on that account, to be promoted by attention to the general management of the animal, as it is well known to undergo a change of properties by starvation, exposure, or any neglect whatever.

(32.) *Particular soils injurious to Wool.*—Soil, also, has much influence on the pliability of wool. Chalky lands, which are so notorious for injuring the fleece, are supposed to act in the manner of a corrosive, but the correct explanation is, not that the chalky particles attack the fibre in a direct way, but that they render it brittle, by absorbing the oily moisture with which it is naturally imbued. Moreover, the plants growing in such situations cannot but be injurious to sheep, owing to their impregnation, though a slight one, with calcareous matter; for grooms know well how soon a horse's coat becomes disordered by the frequent use of hard or well water, and prefer, therefore, the river for their steeds.*

(33.) *Felting.*—The felting of wool may be defined as a property depending on the curls and serrations of the fibre, by which it is allowed to move only with the root foremost, and by which it is enabled to catch

* I am surprised to find it asserted at page 76 of the book on Sheep, published by the Society for the diffusion of Useful Knowledge, that the depilatory action of lime-water on raw hides is a "*striking elucidation*" of the injurious effects of chalk on wool. Lime removes hair from a skin because it is a powerful caustic, and, as such, speedily decomposes the animal matter, but the carbonate of lime (chalk) is perfectly innocuous to wool, except so far as it combines with its oil; and is as little corrosive to the fleece, as pipe-clay to a soldier's coat.

and retain a hold on fibres that are near it, so as to form a web or cloth. Felting is best brought into operation by alternate pressure and relaxation, which may be produced in a variety of ways : the ancient method, and one still pursued by the Tartars, was to tramp on a mass or layer of moist unwrought wool, so as to form a coarse cloth or carpet ; while the modern, and more perfect plan is, either, as in hat making, to apply pressure with the hands, or, as in the finishing of cloth, to pass the fabric repeatedly through rollers. The way in which a close fabric is formed, by the juxta-position of a few scattered hairs, gave rise for long, as well it might, to serious disputations among philosophers ; and the favourite theories of each, unbased as they were on observation, might till now have agitated the scientific portion of our manufacturers, had not the microscope brought to light much of what is true and valuable in our researches.

Moisture appears to be of service during the felting of wool, as it induces it to curl, enabling the fibres to expand, and catch one on another, after they have been bent and compressed, by the force applied to them, and is of itself sufficient to felt a fabric, as we frequently perceive in the instance of stockings, which have been allowed to remain too long in water, when they become short from undergoing contraction, and resemble after such treatment an imperfect cloth. It is for this reason that the hatter, after tumbling over, in all directions, the fur of which the hat is to be made, wets it before applying pressure ; and, that the woollen manufacturer, after freeing the web from grease, soaps it before its subjection to the action of the rollers.

Without felting, cloth would resemble a net, and would unravel on being cut, from the fibres crossing only in two directions; but the strokes of the mill put an end to this, by laying the fibres in every possible direction, and so twining them one with another, as to render them a coherent mass.

(34.) *Different kinds of Wool.*—The wool of this country is divided into two great classes—long and short: the former varies in length from three to eight inches, and before being made into stuffs and worsted goods, requires to be deprived of its felting tendencies, by passing it through heated iron combs, which remove the feathery parts, or serrations, and make it resemble silk or cotton.

The shorter combing wools are in general used for hose, and are softer than the long combing wools. Short wool is employed in the cloth manufacture, and is, on that account, frequently called clothing wool. It should approach in colour as much as possible to white, as a clear white ground is required for all cloths that are to be dyed bright colours, as well as for those dressed white: grey or black hairs injure the fleece very much, even though few and minute, as they give rise to reddish spots where the cloth is stoved. Herefordshire sheep are entirely free from this defect, and are, therefore, reckoned particularly valuable for clothing purposes.

(35.) *Alterations induced by Crossing.*—The breed exercises considerable influence on the wool, some sheep, as the merinos, being distinguished for the softness and beauty of the fleece; while others, as some

of our small northern varieties, are famed for the very opposite characteristics.

According to the opinion on the continent, any race of ewes, however coarse and long in the fleece, will, on the fourth cross of the merino ram, give progeny with short wool equal to the Spanish. The truth of this proposition is however doubted, in a communication to the Board of Agriculture, by Dr Parry of Bath ; but it is certain, he adds, that one cross more will in most cases effect the desired purpose. " If we suppose," he says, " the result of the admixture of the blood of the merino ram to be always in an exact arithmetical proportion, and state the native blood in the ewe as 64, then the first cross would give $\frac{3}{4}$ of the merino, the second $\frac{4}{5}$, the third $\frac{5}{6}$, the fourth $\frac{6}{7}$, the fifth $\frac{7}{8}$, and so on. In other words, the first cross would leave 32 parts in 64, or half of the English quality ; the second 16 parts, or one-fourth ; the third 8 parts, or one-eighth ; the fourth four parts, or one-sixteenth ; the fifth 2 parts or one-thirty-second ; the sixth 1 part, or one-sixty-fourth ; and so on. Now, if the filament of the Wiltshire, or any other coarse wool, be in diameter double that of the Ryeland, it is obvious that, according to the above statement, it would require exactly one cross more to bring the hybrid wool of the former to the same fineness as that of the latter. This, I believe, very exactly corresponds with the fact. The difference between one-eighth and one-sixteenth is very considerable, and must certainly be easily perceived, both by a good microscope, and in the cloth which is manufactured from such wool. In the latter method, it certainly has been perceived ;

but I have had hitherto no opportunity of trying the difference by the former. The fifth cross, as I have before observed, brings the merino-Wilts wool to the same standard as the merino-Ryeland."

(36.) *Bratting injurious to Wool*.—Wool rendered fine by clothing sheep, is never equal to that which owes its perfection to natural causes. The Saxon wool, which is principally produced by *artificial* means, has been compared, from its inelastic sickly appearance, to grass that has been secluded from the sun. The custom of *bratting* is therefore not to be recommended, and indeed is now nearly laid aside. Housing sheep with the same intentions is also bad, inasmuch as it must affect their health, and destroy the curl of the fibre. Shelter is however absolutely necessary from extremes both of heat and cold, as temperature has much influence on the covering of animals, and in none more than the sheep.

CHAPTER III.

BRITISH WOOL TRADE.

(37.) *Origin of the Wool Trade*.—Wool, since Eden closed its gates on our progenitors has been a current coin, an important material, on which has been employed the skill and industry of almost every tribe, and been the means of raising many a petty people to the hard-won dignity of a nation. Man, at first placed in a *comfortable* temperature, needed little as a defence

against the weather ; while fashion, then unthought of, or only as a sport, failed to interest the simple-minded races in the cut or texture of the coverings they wore. That the first dresses of mankind were formed from vegetable materials, we have the highest authority for believing ; and even at present, the garb of the natives of some of our lately discovered islands, consists of a simple girdle formed from rough-cut reeds. But as the dawn of knowledge smiled upon the savage, and animal sacrifice tutored him in the uncouth rudiments of a coarse anatomy, the superior comfort, even of the untanned hide would be remarked, and the clumsy mantle of the Caffre hordes welcomed as a change. Time would not long elapse till roving dispositions, and the encounter of unstable climates, would show the wanderer the necessity of a fabric better adjusted by shape and pliancy, to the nature of his wants ; while the clinging of lock to lock of woolly fibre would plainly tell the superfluous nature of the supporting skin, and point the way to make an ill-closed cloth.

(88.) *Invention of Weaving.*—Weaving is not absolutely necessary for the manufacture of cloth, since wool will felt, though far from evenly, without the preliminary process of being laid in threads, so that cloth may have been almost coeval with mankind without our being required to assign much mechanical ingenuity to its inventors. But we have tolerably clear evidence in the inspired writings, that weaving was known in the earliest ages, and that it was trusted principally to the women :—Thus Dalilah wove Samson's hair when he slept in her lap ; and a short time after, it is written, *that the mother of Samuel " made him a little coat,*

only to enrich the countries they subdued, England may bless the hour which saw the legions of the world's mistress planting the Imperial Eagle on her shores.

Instead of following the progress of the wool trade among foreign nations in later times, the limits of the present work compel me to confine myself to an outline of the British trade from its origin, at the time of the invasion by the Romans, to the present period.

(40.) *Introduction of Weaving into Britain.*—It is evident from ancient history, that the first inhabitants of all the countries of Europe were either naked, or nearly so, owing to their ignorance of the clothing art. Such, in particular, was the uncomfortable condition of the inhabitants of this island, who are supposed to have used the bark of trees, and to have smeared themselves with unctuous matter, after the manner of other savages, to protect themselves from cold. Some writers are of opinion, that the inner bark of trees alone was employed, and that not till woven into a kind of cloth, such as the South Sea islanders at present make. They continued the abominable practice of anointing their bodies, long after the people of France, Spain, and Germany, were decently clothed, so differently were they situated in regard to intercourse with strangers, and opportunities of acquiring the useful arts. It is impossible to discover with certainty when, or by whom, the custom of wearing clothes was introduced into Britain. Some suppose that the Greeks, and after them the Phœnicians, who visited the Scilly islands, and sometimes the continent of Britain, for trading purposes, first *awakened in the breasts of our savage ancestors a de-*

sire for comfortable coverings, as both these nations were celebrated for elaborate attention to their attire.

"The Britons," says Cæsar, "in the interior parts of the country are clothed in skins." These are supposed not to have been sewed together, but to have been cast over the shoulders as a mantle. Their stiffness, however, rendered them aught but pleasant, as we may guess from their endeavours to make them soft and pliable, by steeping in water, beating them with stones and sticks, and rubbing them with fat. The people of the southern parts are supposed to have been well acquainted with the dressing, spinning, and weaving, both of flax and wool, having been instructed by a Belgic colony, long before the invasion by the Romans. Two kinds of cloth, which they manufactured at this period, were much esteemed by their invaders; the one a thick harsh cloth, worn in cold climates as a sort of mantle, and agreeing in many respects with our Lowland plaids; the other made of fine wool, dyed of different colours, woven into chequered cloth, and corresponding to our Highland tartan. They are also believed to have made felts of wool, without either spinning or weaving, and to have stuffed mattresses with the portions shorn from it in dressing. The Britons must have been well acquainted with the dyeing of wool, as the Gauls were then celebrated, according to Pliny, for the invention of a "method of dyeing purple, scarlet, and all other colours, only with certain herbs." The plant, which they chiefly used for the purpose, was the glastum or woad, and they seem to have been led to the discovery of its value in dyeing cloth, from their former use of it in staining their bo-

dies. A deep blue having been the colour they stained their skins, it long continued a favourite ; particularly with the Caledonians, as a tint for all their dresses. Though the most civilized of the ancient Britons were tolerably versed in the most essential branches of the woollen manufacture, yet that useful art was not diffused over our island till the landing of the Romans, whose soldiers, being almost all drawn from the plough, were well adapted, when settled in the country, to foster the arts of peace. In order to benefit themselves and the island, their emperors were at great pains to discover and procure the best artificers of every description, particularly the best manufacturers of woollen and linen cloths, whom they formed into colleges, or corporations, endowed with various privileges, and governed by a procurator, who was under the direction of that great officer of their empire, the Count of the Sacred Largesses. In this manner it appears that the first woollen manufactory was established at Venta Belgarum, now Winchester, a hundred years after the conquest of the country.

It has been believed, from Britain having been partly peopled from Spain, that our sheep were originally Spanish ; and, as Giraldus Cambrensis (*Collectan. de Reb. Hibern.*) affirms, that the Irish in his time were clothed in black garments, from the wool of their sheep being so coloured, some have supposed the sheep of that island were imported from Spain, a supposition rendered probable by Southey telling us, in his letters from that country, that in the north of the Peninsula the animals are almost all of a black colour.

No mention ever occurs in the ancient writers, of

the importation of sheep into Britain, from which it may be supposed, that they had found their way into it long before its forcible separation from the continent by natural convulsions. Cambden, in his work on Britain, quotes from an old orator, part of a beautiful panegyric on the great Constantine, in which the happiness of Britain is eloquently described, and its advantages in regard to sheep graphically depicted. "Innumerable are thy herds of cattle, and thy flocks of sheep, which feed thee plentifully, and clothe thee richly." So that, even allowing for the high-flown nature of the verbiage, the sheep of the island must have been far from indifferent, and well worthy of any trouble the grasping Romans may have been put to, in the erection of manufactories.

(41.) *Importance of the British Woollen Manufacture.*—The history of our wool, and the woollen manufacture, is, at one period and in one point of view, the history of our public revenue, while in a succeeding period it becomes the capital object of our commerce, and the important subject of our political councils. The preserving and supporting it against foreign rivals, the due regulation of its numerous branches, and the proper restrictions deemed requisite to ensure to this country the commercial benefits resulting from it, have occupied our ablest statesmen for many centuries.

The wools of England have always been in the highest repute, and that more abroad than at home. Their fineness and abundance have been ascribed by many to the sweet short grass on most of our downs and pastures, and to the sheep having the privilege of

feeding, all the year round, without being shorn ; folds ; but it cannot be denied, that, though food ~~and~~ climate may have much concern in the matter, ~~the~~ energetic industry and persevering attention with which an Englishman devotes himself to the attainment of an object, have tended more than any other circumstance to the advancement of our wools, and woollen manufactures, and to the consequent prosperity of our island.

The reason of the existence of so many laws relating to wool is, that it continued for ages to be the principal commodity, meeting all demands for the support of armies, and payment of public revenues, and affording aids to the crown, which were in general granted therein. The scarcity of money in England before the discovery of America, rendered it necessary to levy taxes frequently in kind, and as wool was abundant, it often figured as the representative of a more portable currency. Part of the £300,000 demanded by the Emperor of Germany as the ransom of Richard I., was raised by a loan of wool. Edward I., the great reformer of our laws, imposed a duty of 6s. 8d. on every sack of wool exported, and the like sum on every 300 wool-fells ; but soon after, when his necessities demanded a larger income, he laid those additional duties on foreign merchants, which afterwards became the tonnage and poundage, so famous in England's history. Among these additions, the former taxes on wool and fells were increased by forty pence, while at the same time, like other monarchs of the period, he occasionally received subsidies of wool. *In the same way* Edward III., in attempting, during

the twelfth year of his reign, to wrest the crown of France from the house of Valois, procured a grant of half the wool in England, amounting to 20,000 packs, which, taking it as valued by some authors at £40 a pack, must have realized the sum of £800,000.

(42.) *Weavers brought from Flanders*.—Commerce and industry were at a very low ebb during the time of Edward III., the principal export being wool, which only brought into the kingdom about £450,000. Edward promoted the woollen manufacture by bringing, in 1331, John Kemp, with seventy Walloon families, weavers, from Flanders, and, owing to the want of native skill in this department, gave every encouragement to foreign weavers. (11 Edward III. cap. 5.)* A further encouragement was given to the home manufacture, by the enactment of a law (11 Edward III. cap. 2) which prohibited every one from wearing any cloth not of English fabric. Parliament, however, in an evil hour, thwarted these benefits, by prohibiting the exportation of woollen goods, certainly an injurious step, so long as wool was allowed to be shipped from our ports.

On the introduction of the Flemish weavers, Kendal became the metropolis of this branch of industry, and was soon equalled in the extent of its manufactories by many other towns, as Norwich, Sudbury, Colchester, and York; while woollens were spun and wove, though to a less extent, in Devonshire, Worcestershire, Gloucestershire, Hampshire, Berkshire Sussex, and Wales.

* Macpherson, in his *Annals of Commerce*, agrees with Bloomfield the historian of Norfolk, that a colony of Flemish weavers settled so early as 1327, at Worsted, a village in that county, and bestowed upon it the name it bears.

(43.) *Regulations regarding Staples.*—The *staple*, or market for wool, was fixed by act of Parliament (27 Edward III.) in particular towns of England, but was afterwards removed by law to Calais, and English merchants were prohibited from exporting any goods from the staple, or, in other words, foreign navigation was abandoned. To the custom of taking subsidies in kind, may be traced the principle of those multifarious regulations which fixed the staple in certain towns, either in England, or more commonly on the continent; and to the fluctuating state of politics may be ascribed the shiftings which those staples so frequently underwent; but it is not easy to see the drift of many of the provisions relating to it, some of which tend to the benefit of foreign, rather than of British, commerce.

(44.) The progress which this manufacture made in a very short period, may be well illustrated by the following table of exports and imports in woollen, about the middle of the fourteenth century, or twenty years after the arrival of John Kemp and his establishment.

EXPORTS.

Thirty-one thousand, six hundred and fifty-one and a half of wool, at L.6 value each sack, . . .	£189,909	0	0
Three thousand, thirty-six hundred and sixty-five fells, at 40s. value, each hundred at six score, .	6,073	1	8
Whereof the custom amounts to .	81,624	1	1
Fourteen last, seventeen dicker, and			
	<hr/> £277,606 2 9		

Brought forward,	£277,606	2	9
five hides of leather, after L.6 value			
the last,	89	5	0
Whereof the custom amounts to .	6	17	6
8,061½ of worsted, after 16s. 8d. value,			
the price is	6,717	18	4
Whereof the custom amounts to .	215	13	7
<hr/>			
Summary of the out-carried com- modities in value and custom, }	£285,635	17	2
<hr/>			
IMPORTS.			
1,832 cloths, after L.6 value each, .	10,922	0	0
Whereof the custom amounts to .	91	12	0
<hr/>			
Summary of the in-brought wool- lens in value and custom, }	£11,013	12	0

That the imported cloths were much finer than those exported, may be inferred from their comparative value as here stated, and we may conclude pretty justly, that the fabrication of coarse cloths exclusively occupied the manufacturers of Britain, while the finer fabrics were still brought from abroad, and that, in fact, the wants of the *mass* of the people were the regulators of British industry.

(45.) *Subsidies raised by Edward III.*—In 1338, Edward took a fifteenth of all the commonalty of his realm in wool, rating the price of every stone of 14 lbs. at 2s., although, in the previous November, he had sent the Bishop of Lincoln, and the Earls of Suffolk and Northampton, with one thousand sacks of wool, into Brabant, which, being sold at L.40 a sack, pro-

cured him L.40,000. Edward was apparently not very sure how far his subjects would submit to so sweeping a taxation, as we find him addressing a letter, dated Berwick-upon-Tweed, March 28th, 1338, to the Archbishops of York and Canterbury, desiring the favour of their prayers, and requesting that they would excuse him to his people, on account of the great taxes he was obliged to lay upon them. During the summer of 1339, the laity granted to the king the one-half of their wools throughout the whole realm, a favour his majesty is reported to have received most graciously; but of the clergy he levied the whole, compelling them to pay nine merks for every sack of the best wool. Knighton, who held an office in the Abbey of Leicester, says that that house alone furnished eighteen sacks. 'The revenue officers during this reign appear to have exercised their calling with great strictness, and to have interfered in an especial manner with the secret trade of the inhabitants of Bristol, but this was terminated by the king granting a licence, dated Langley, November 25th, 1339, to their weavers, allowing them "to make woollen cloth without being liable to any molestation from the king's officers."

(46.) *Progress of the trade under Henry VII., Henry VIII., and Edward VI.*—During the bloody and destructive wars of the white and red roses, when success graced the arms alternately of York and Lancaster, commercial enterprise was almost at a stand. This unhappy period brought, however, with all its evils, blessings in its train, and Henry VII. not only did more for the advancement of the wool-trade than his predecessors, but also gave it greater vigour than it

could lay claim to at any former period. Fine cloths were much improved in his reign, and luxury began to be attended to in an article, which, till then, had only been rendered amenable to comfort. The ostentatious reign of Henry VIII., gave an additional impulse to the trade, and cloth was sold in 1512 for five merks, which fifty years before would only have brought about forty shillings; while, in consequence of increasing wealth, population, and consumption, the demand was materially increased. A new market was also opened up for the export of their woollens, by the establishment of an intercourse in 1516 with several islands in the Archipelago, and a few of the towns on the coast of Syria.

Edward VI., or rather his ministers, for he was then a minor, attempted to lay a poll-tax upon sheep, every ewe kept in a separate pasture being charged three-pence, every wedder twopence, and all sheep kept on commons three-halfpence; but it was found to be so oppressive, so annoying to the people, and so difficult to collect, that it was repealed during the next year. England made a distinguished figure in this reign as a commercial nation. The manufacture of woollens was raised to a great height. Cloth, besides being exported to Flanders, found its way to Holland, Hamburgh, Sweden, and Russia, whose coarse warm stuffs were very much wanted, and the trade wore such an air of affluence, that a tax of eightpence in the pound was laid upon all cloth made for sale in England. This, however, was speedily repealed, a very short time serving to point out, that, though made for an *endurance of three prosperous years*, the people who were

galled by a trifling impost on their sheep, would ; unless under very favourable circumstances, submit imposts on the fabrics which they wore.

During the reigns of Henry VII., Henry VIII. and Edward VI., an undue preference was given to grazing. Acts were framed to put a stop to this mismanagement, which was fast ruining the country, by driving people from it. Henry VII. exempted Norwich from the penalties of the law, on account of the decay of manufactures from the want of hands ; and shortly after the whole county of Norfolk obtained a like exemption in regard to some branches of the woollen trade. The practice of depopulating the country, by abandoning tillage, and throwing the lands into pasturage, had run to so great an extent in the time of Henry VIII., that an enactment was made, whereby the king became entitled to half the rents of the land where any farm-houses were allowed to fall to decay. The number of sheep in a flock was at the same time limited to two thousand. Hume conjectures, in his *History of England*, that unskilful husbandry was probably the cause why the proprietors found no profit in tillage ;—thus leading a farmer to keep a flock sometimes of twenty-four thousand as expressed in the statute. This had the effect of increasing the price of mutton, a remarkable coincidence, which parliament attributes to the commodity having gotten into few hands, though Hume ascribes it to the daily increase of money, thinking it almost impossible that such an article could be engrossed. At the commencement of the reign of Edward VI., the people were still sadly deficient in a knowledge of agriculture—a profession, which, as Hume wisely

remarks, of all employments, requires the most reflection and experience. A great demand having arisen for wool both at home and abroad, whole estates were laid waste, while the tenants, regarded as a useless burden, were expelled their habitations, and the cottagers deprived even of the commons on which they fed their cows ; no wonder there was a decay of the people !

(47.) *Wool Trade encouraged by Elizabeth.*—Elizabeth extended her protection to the Protestants who fled from the persecutions of the Duke of Alva in the Low Countries, and the woollen manufactories became more flourishing than ever—so much so, that, although in 1552, a large quantity of raw material was exported, yet in less than thirty years, the people of Germany, Poland, France, Flanders, Denmark, and Sweden, were covered with British cloths ; two hundred thousand pieces being annually exported, though the price was nearly tripled. At that time the processes by which woollens are rendered beautiful were unknown in England, and as our exports consisted in white undressed cloth, the profits upon dyeing and finishing, amounting to nearly a million a year, were lost. This was attempted to be remedied by prohibiting the exportation of white cloths, but the Dutch and Germans, who benefitted by the dyeing processes, forbade the entrance of any English woollens dyed in the piece, into their territories, and the export consequently fell immediately from 200,000 to sixty pieces. Then the restriction was taken off. It was at this crisis that the fabrication of medley cloths, or mixtures of wool dyed of different colours and wrought into the same web, was commenced.

(48.) *Woollen Cloth monopolized by the merchant adventurers.*—Though nine-tenths of the commerce of the kingdom consisted in the time of James I. of woollen goods, wool was allowed to be exported till the nineteenth year of his reign, when it was forbidden by proclamation, but never strictly enforced. The cloth was very little admired even at home, and though it was the staple commodity of the realm, a company of merchant adventurers were allowed by a patent, to possess the sole disposal of it. Elizabeth at one time attempted to rescue this important trade from the hands of these merchants, but they instantly conspired, and ceased to make purchases of cloth, when the queen was necessitated to restore the patent. A board of trade was brought together by James I. in 1622, and one of the purposes contemplated was to remedy the low price of wool, which was leading the people to complain of the decay of the woollen manufacture ; but Hume supposes, and with every appearance of probability, that this fall of prices proceeded from an increase of wool.

(49.) *English consumption of Wool increased.*—Till the fifteenth century our wool was sold in the fleece to such as came to buy it. Among the principal of our customers were numbered the Flemings, and Brabanters, and in particular the merchants of Ghent, and Louvain, who took off vast quantities for the supply of two manufactories, that had flourished in those cities from the tenth century, and had furnished the greater part of Europe, and even England itself, with every kind of woollen cloth. Thus they *might have continued*, to the great loss of our island,

had not the democratic hands employed in those manufactories repeatedly revolted, owing to their determination to resist a tax on looms, and being at length punished and dispersed, found their way in no long time to Holland. While in the last place, the spirit of sedition still being dominant, certain of their party attacked and killed some of the civil authorities, for which they had to make a precipitate flight to England, where they settled as peaceful citizens, and instructed our people in the working of wool. This occurred in 1420, from which time neither skill, money, nor enactments, have been spared to enable us to retain so valuable a trade. In the reign of Edward IV., every pack of English wool was liable when exported to a custom of 50s., a goodly sum in those days, and one which brought a yearly revenue of L. 250,000. This excessive custom, almost amounting to a prohibition, added to the above mentioned opportunities, in a manner compelled the people to manufacture for themselves, and in this they succeeded so well, that by the time of Elizabeth, the exportation of live sheep and wool was prohibited on pain of having the right hand struck off. It does not appear that this enactment was ever repealed, though supposed to be so by the 12th of Charles II. cap. 32, sec. 3, which, without taking away the penalties imposed by former statutes, imposes a new penalty;—20s. for every sheep exported, or attempted to be exported, together with the forfeiture of the sheep.

(50.) *Severity of prohibitory enactments reprobated.*
—By the 14th of Charles II. chap. 18 the exportation of wool was deemed felony, and punished accord-

ingly. This tended in no slight degree to the defeat of the ends intended, by hindering all who were not cold-blooded from bringing to justice the actors in so trifling an offence. This was soon however seen through, and corrected, by the 7th and 8th of William III. chap. 28, sec. 4, in which it was declared, that "Whereas the statute of the 13th and 14th of King Charles II., made against the exportation of wool, among other things in the said act mentioned, doth enact the same to be deemed felony, by the severity of which penalty the prosecution of offenders hath not been so effectually put into execution ; be it therefore enacted, by the authority aforesaid, that so much of the said act, which relates to the making the said offence felony, be repealed and made void."

Adam Smith, when commenting in his "Wealth of Nations," on the laws relating to wool, reprobates severely the ill-judged compliance of our government, in yielding to the solicitation of our merchants, and allowing them to sway with iron rule the commerce of the world. "The severity of many of the laws which have been enacted for the security of the revenue, is very justly complained of, as imposing heavy penalties upon actions, which, antecedent to the statutes that declared them to be crimes, had always been understood to be innocent. But the cruelest of our revenue laws, I will venture to affirm, are mild and gentle in comparison to some of those which the clamour of our merchants and manufacturers has extorted from the legislature, for the support of their own absurd and oppressive monopolies. Like the laws of Draco, these *laws may be said to be all written in blood.*" None of

the laws, however, were effectual, not even the one passed in the middle of the seventeenth century, by which the offence was rendered capital. In spite of the vigilance of our government, a contraband trade in wool was long carried on between the inhabitants of the French and English coasts, especially those of Sussex, by a class of men called *Owlers*, from their only venturing abroad in the night, and who were tempted to despise the penalty, with an intrepidity astonishing to the rest of Europe, by the high prices that were sure to be afforded to them in the Gallic market. Again, during the first half of the eighteenth century, large quantities of wool were constantly smuggled from Ireland to France, by which our trading interests were considerably injured, and the plans for suppressing exportation shown to be worse than useless.

(51.) *Prosperity of the Dutch Manufacturers.*—The woollen manufactures of the Hollanders were first established in 1636, or 1637, by one hundred and forty English families, who went from Norfolk and Suffolk, to settle at Leyden, and Alkmaer. The Dutch manufacture of fine woollen cloths was, however, commenced much earlier, or about 1624, at which time they began to interfere with the English trade in the Netherlands; insomuch that, in the twenty-second year of the reign of James I., a certificate was given to the Parliament of 25,000 cloths having been made that year in Holland. Upon this the House of Commons resolved, 1st, “That the merchant adventurers setting impost upon our cloth, is a grievance, and ought not to be continued; and that all other merchants promiscuously,

as well as that company, may transport everywhere northern and western kersies, and new draperies."

2dly. "That other merchants, besides the Merchant Adventurers' Company, may freely trade with dyed and dressed cloths, and all sorts of coloured cloths, into Germany and the Low Countries." Much annoyance appears to have resulted to this island, from the progress which the manufacturers in Holland still continued to make, and some curious speculations were of course formed in the minds of the ingenious. In 1651, a scheme was laid before the English commonwealth, for obtaining from the court of Spain an exclusive right to purchase *all* the Spanish wool; or, in other words, to ruin the Holland market, by stopping the supplies. The projector observed, "That this proposed pre-emption would totally dissolve the woollen manufacture of Holland, which, by means of that wool (Spanish), hath of late years mightily increased, to the destruction of the vent of all fine cloths, of English manufacture, in Holland, France, and the east country; and hath drawn from us considerable numbers of weavers, dyers, and cloth-workers, now settled at Leyden, and other towns in Holland, by whose help they have very much improved their skill in cloth, and have made in that one province (one year with another) 24,000 or 26,000 cloths yearly. That the Hollanders have of late years bought and exported from Biscay, four-fifth parts at least of all their wools, and have sold there proportionally of their own country stuffs." This was certainly a novel method of accomplishing an end by a sweeping monopoly; but the theory was too fine-spun *ever to be reducible to practice.*

(52.) *Fluctuating State of the Trade between 1635 and 1693.*—By the great act of tonnage and poundage, passed in 1660, on the restoration of Charles II., taxes were imposed, among other things, on the exportation of woollen manufactures, and it was not till the reign of William, that the wretched policy of such regulations was discovered, and a law was passed in 1700, by which the duties on woollens were abolished, because in the words of the act (11 & 12 William III. chap. 20), “the wealth and prosperity of the kingdom doth, in a great measure, depend on the improvement of its woollen manufactures, and the profitable trade carried on by the exportation thereof.”

In the time of Charles II., an act was passed for the erection of manufactories (Par. 1, Sess. 1, Cap. 40), by which it is enacted, that no native or stranger is to export wool nor skins with wool upon them, until made into work, or put to the best advantage, under the pain of first value thereof, half to the king, and half to the informer. It is also, in this act, ordered, “that none forestall the mercat of wooll, nor keep up the same to a dearth, under the pain against regrators and forestallers, and that for eschewing the deceit of putting stones, or the like stuffs therein, no wooll be wrapt up in the fleece, under the pain of confiscation, half to the king, and half to the discoverer and pursuer, declaring always that the Exchequer may licence the export of wool and skins, as they shall see cause.”

The French refugees, in 1635, brought money and talent into England, and contributed greatly to the erection of manufactories for *slight* stuffs, and other French fabrics, never before made in England. The

former law for burying in woollen not being well observed, it was repealed by an Act of Parliament, in the thirtieth year of that king (cap. 3.), which enacted a register to be kept in every parish, by the incumbent or his substitute, that every thing about the corpse of the deceased was made of sheep's wool, of which an affidavit was to be made by the relation of the deceased, and lodged with the incumbent, under the penalty of £5, a moiety of which went to the poor of the parish; the rest to the informer. But this was a sorry check, as vanity was so predominant among the rich, that they paid the penalty rather than want the pleasure of adorning their departed relatives with lace and linen.

In 1667, France supplanted England in many foreign markets, owing to the care that Colbert at that time took to bring the French woollens to perfection. The English immediately turned their attention to other manufactures, in which, as in that of paper, they quickly excelled, and thus compelled the French to abandon markets, in which they had long remained without a rival.

In 1698, a problem was started concerning the manufactures of the country—whether or not a general linen manufacture would prove beneficial to England? As London at this time abounded with new projects and schemes, all promising as usual a hoard of wealth, the question caused much excitement. It was at last determined that a novelty of this kind would lead to the sowing of a great quantity of flax in England, and the neglect of the woollen manufacture, which would follow, might probably lower the price of land; for, as *they said at the time*, “it requires about twenty acres

of land to breed wool, for setting on work the same number of hands which one acre of flax would employ; and yet, in the end, the woollen manufacture will be found to employ by far the greatest number of hands, and yield the most profit to the public, as well as to the manufacturers."

(53.) *Irish Manufactures discouraged.*—In the same year (1698), the English house of Peers addressed King William with the view of inducing him to discourage the woollen manufactures of Ireland, which, in spite of many restrictions, still continued to cause much vexation to the monopolizers of England. The address ran thus :—" The growing manufacture of cloth in Ireland, both by the cheapness of all sorts of the necessities of life,* and *the goodness of materials for making all manner of cloth*, doth invite his subjects of England, with their families and servants, to leave their habitation to settle there, to the increase of the woollen manufacture in Ireland, which makes his loyal subjects in this kingdom very apprehensive, that the further growth of it may greatly prejudice the said manufacture here; and praying, that his Majesty would be pleased, in the most public and effectual way that may be, to declare to all his subjects of Ireland, that the growth and increase of the woollen manufacture there, hath long, and will ever be, looked upon with great jealousy by all his subjects of this kingdom." A similar address was presented by the Commons, and

* The people of Ireland produced worsted and woollen yarn at a cheaper rate than we could, owing to their poor being able to work on lower terms than those of England. This was owing to the rent of land being less in Ireland than in England.

this most liberal and enlightened monarch was pleased to answer, "*Gentlemen, I will do all that in me lies to discourage the woollen manufacture of Ireland.*" This was certainly altogether a strange proceeding, especially when viewed in conjunction with the cruel prohibitions of former periods.* Their foreign trade is said by some to have been much diminished by this coolness ; but much of the poignancy and crushing animosity of the request are lost when we consider that encouragement was at the same time given by England to the making of Irish linen, his Majesty being desired in the same address, to forward that manufacture, pursuant to the dictates of an act passed in 1696. Nay, some are of opinion that these measures resulted from the soundest views of the relative situations of the countries, and that the prudent tenor of English enactments was never better exhibited, than in the discouragement of the woollen and encouragement of the linen manufactures of Ireland.

(54.) *British Trade in 1699.*—In 1699 there were 12,000,000 sheep and lambs in Britain, and the yearly increase was supposed to be about 3,600,000. The value of each sheep, besides the skin, was 7s. 4d. The stock was valued at £4,400,000. The value of the wool yearly shorn, at 3s. 4d. per fleece, came to about £2,000,000. The woollens manufactured in Britain

* By the 18th of Charles II. the importation from Ireland into England of great cattle, sheep, swine, beef, pork and bacon, and shortly after of mutton, lamb, butter, and cheese, was declared a common nuisance, and forbidden on pain of forfeiture. Thus, the principal resource of a poor country in the neighbourhood of a rich one, was unfeelingly denied to it, till the reign of George III, when the hated edict was repealed.

amounted in value to £5,000,000 per annum, while our yearly exports of the same were valued at £2,000,000. Many were at that time afraid of the sinking of the woollen manufacture, because the accounts of the fine draperies exported were larger than usual ; but, says an anonymous essayist of the period, "such do not contemplate, that, though the old may be lessened, what is commonly called the new draperies have increased, consisting in bays, serges, and stuffs. So that upon the whole, infinitely more of the material of wool has of late years been wrought up for foreign use, than in former times ; and herein our merchants have been only forced to follow the modes and humours of those people with whom they deal, and the course they have pursued has hitherto not been detrimental to the public." * * * " 'Twere better, indeed, that the call from abroad were only for the fine draperies, because then we should be in a manner without a rival ; no country, but England, and Ireland, having a sward or turf that will rear sheep, producing the wool of which most of our draperies are made. 'Tis true the wool of Spain is fine above all others ; but 'tis the wear only of the richer sort, and of Spanish cloths not above nine thousand pieces are sent abroad, one year with another."

(55.) *British Woollens rivalled by those of Sweden.*—Before the peace of Utrecht in 1713, we had no rival in the woollen trade but the Dutch, over whom we had many natural advantages, such as situation, goodness of our ports, and excellence of the principal constituents of the manufacture. They were obliged to furnish themselves with the materials at second-hand. When

the trade in woollens was properly set a-foot in England, during the long and happy reign of Elizabeth, the interest of money was pretty much the same in both countries; but the Dutch were engaged in a hazardous and bloody war, and in establishing their Commonwealth, and East India trade; and, therefore, had not much time to think of improving any manufacture. Owing to these circumstances, we came into possession of all the principal marts for woollens, both in Asia and Europe, and retained them till the beginning of the war with France and Spain; we then prohibited trade with both these countries.

About the year 1720, our exportations to Sweden, of cloth, stuffs, and other woollen manufactures, amounted to £50,000. The Swedes, however, though situated in a severe climate, tried experiments with English sheep, and with so great success, that, in 1765, they could boast of wool little inferior to that of England. They then erected manufactories, and we were compelled to relinquish a market, which we had long held to our profit and advantage.

(56.) *Regulations from 1740 to 1742.*—In the 12th year of King George II: it was enacted by a statute (cap. 21), “That whereas the taking off the duties upon woollen or bay yarn imported from Ireland, may be a means to prevent the exportation of wool, and of woollen manufactures, from Ireland to foreign parts, and may also be of use to the manufacturers of Great Britain, that from the first of May, 1740, the same shall be no longer payable; excepting only the duties upon worsted yarn of two or more threads twisted or thrown, or on crewel imported from Ireland. At this

time more than 1,500,000 persons were employed on woollen articles, and were supposed to earn, one with another, sixpence a-day for 313 working days, amounting in all to £11,737,500 yearly.

In 1742, the English poor suffered much from the contempt with which home manufactures were regarded by the nobility, in consequence of which the latter were speedily the losers. The importation of woollen broad-cloth, of the manufacture of France, into ports of the Levant, on behalf of British subjects, being not only prejudicial by discouraging the woollen manufactures of Britain, but likewise a means of affording relief to an enemy, and discoveries having been made of British subjects fraudulently shipping from Leghorn quantities of French woollen goods for Turkey, under the denomination of British, to the great detriment of English woollens; an act was passed in the 23d year of King George II. by which provision was made against these and other fraudulent practices.

(57.) *Improvements in the manufacturing of Woollens.*—At the commencement of the reign of George III. the woollen manufactures advanced with a rapidity almost unparalleled in modern times as regards other branches of trade. Till about the year 1770 most of the processes were conducted by hand. The wool was spun by various persons at scattered residences, the manufacturers receiving the yarn periodically from the numerous spinners. This arrangement caused much loss of time, and gave rise to frequent squabbles between the masters and their workmen. In fact, all the operations were tardy in the extreme. But at this period, the spirit of public and private inquiry was happily

directed to our deficiencies in the machinery of manufactures. Inventions of great beauty and ingenuity were slowly brought forward to facilitate our commercial acquirements. Human labour has thus been lightened and abridged,—a greater number of hands have been profitably employed, and an excellent lesson afforded to the lovers of use and wont, which will not speedily be forgotten.

By these improved means the cloth is possessed of greater evenness, less injury is sustained in the dressing and shearing, and greater beauty is imparted to its appearance. A great advantage is also obtained by the master knowing the exact duration of each process, so that he can time his goods for any hour, or market, and is enabled to circulate his capital with a degree of certainty, and despatch, formerly looked upon as quite impossible. A few years ago the late Sir John Throckmorton sat down to dinner, dressed in a coat, the wool of which, on the same morning, was on the sheep's back. The animals were sheared, the wool washed, carded, spun, and woven; the cloth was scoured, fullled, sheared, dyed and dressed, and then made into a coat. All these complex operations were gone through without hurry, and without deducting from the work any part of the time usually devoted to similar fabrics. So great was the advantage derived from this application of machinery, that in the year 1800 the produce was three times larger than in the year 1739, though the number of persons employed was the same in the one year as in the other.

(58.) *Duty imposed on imported Wool.*—For three centuries a free importation of foreign wool was per-

mitted by our government, and it was not till 1803 that any one thought of laying a duty upon it. This duty was at first comparatively light, amounting only to a halfpenny a-pound, and it continued under a penny a-pound, till 1819, when Mr Vansittart raised it to sixpence. The impolicy of this measure is evident, when we consider, that we were losing our ascendancy in this manufacture, that our export of woollen goods had been declining for three years previous to 1819, and that the competition was becoming every moment more severe. This tax was much dreaded by our merchants, who, clearly perceiving the state of matters, warned Mr Vansittart, by representing to him, in the strongest terms, the fatal influence it would have upon our trade. Its effects are best exhibited by its disastrous influence on the foreign trade in woollens, which fell off about a fourth in value, almost immediately after the imposition. The following table places this in the clearest point of view :—

Declared value of woollens exported.

1816,	£9,387,455
1817,	7,847,280
1818,	7,177,335
1819,	8,145,327
1820,	(duty increased)	5,989,622
1821,	(ditto)	5,587,758
1822,	(ditto)	6,465,988
1823,	(ditto)	6,490,454
1824,	(ditto)	5,635,776
1825,	(ditto)	6,045,240

The opinions of our merchants ought to have formed the best of all beacons in pointing the course to be

pursued by Mr Vansittart ; but, even if they had been silent on the subject, the evidence of Mr Bainbridge, before the Committee of the House of Commons, appointed in 1820, to inquire into the state of the foreign trade of the country, might have informed him of the true position of the wool trade, and directed him in so hazardous an undertaking. When Mr B. was asked whether he thought that an increase in the means of paying for our manufactures would produce an increased consumption of them in Russia, Sweden, and Prussia, he replied :—" I believe the woollen manufactures in Prussia are in such a state as to be able to compete with us completely ; I speak of it particularly, because we are in the habit of having transactions with the United States of America ; and I find that a very considerable proportion of fine woollens, and stuffs, are absolutely shipped from the Netherlands, and from ports contiguous, part of which I understand to come from the interior of Germany, and from Saxony in particular ; so that a portion of the trade, which we have been in the habit of transacting with the United States, is finding its way from the north of Europe. I, therefore, conceive, that their manufactures are competing with the manufactures of this country, and, consequently, they would not come to us to receive a supply of those articles which they can purchase from their own manufacturers at home." In 1825, at the earnest and obviously well-founded representations of the manufacturers, Mr Huskisson reverted to the old system : and it was then wisely enacted, that all foreign wool imported for home consumption, of the value of 1s. a-pound and upwards, should pay a duty of 1d. a-pound ;

but when the value of foreign wool was under 1s., the duty was reduced to a halfpenny per pound. A boon was at the same time conferred upon the agriculturists, by the introduction of a new system with respect to the exportation of British wool, the growers of which were allowed, for the first time, to send it to foreign markets, on payment of a penny per pound.

(59.) *Removal of the Restrictions on Foreign Wool.*

—The importation of wool was, by these reductions, speedily increased, and with it the consumption of our woollens by foreign nations. The wool of our own gradually augmented flocks being inadequate to the demand, and that of Spain having been absorbed by our manufactories, large quantities were imported from Prussia, Saxony, and many parts of the continent of Europe, from which, antecedent to this run, little had been drawn. The average annual import of wool during 1765-66-67 was 4,241,364 pounds—the average annual export of woollens during the same period was £4,630,384 ; while the average annual import of wool for the years 1822-23-24 was 18,884,876 pounds, and the average annual export of woollens during the same time, amounted to £6,200,548, showing that the importation of foreign wool was absolutely necessary for the well-being of our manufactures. The importation of forty-four millions of pounds weight, in the year ending 5th January, 1826, must be ascribed as much to the spirit of over-trading, which then affected every branch of industry, as to the reduction of the duty ; but the large importations during 1827, afforded an additional proof of the necessity of foreign wool to the successful formation of a most important article of com-

merce. Mr Gott of Leeds, in his evidence before the Lords' Committee, on being asked if he could carry on to the same extent as at present, if he manufactured his cloth of British wool, replied, that, in certain descriptions of cloth, "*he could not make an article that would be merchantable at all for the foreign market, or even for the home market, except of foreign wool.*" He then proceeds to state, that though the competition is very strong in every department of the manufacture, yet that foreigners are decidedly superior to us in some description of low cloths. The following question was then put, and plainly and emphatically answered:— "*Speaking of the finer cloths, is the competition such as to render an additional duty on the importation of foreign wool likely to injure the export trade? I have no doubt, speaking on my oath, that it would be fatal to the foreign cloth trade of the country. I would further say, that it would be equally injurious to coarse manufactures of all kinds made of English wool.*" The competition now with foreigners is as nearly balanced as possible, and the disturbing operation of attacks of that description would necessarily enable the foreigner to buy his wool cheaper than we should do it in this country; the result would be, that foreigners would, by such a premium, be enabled to extend their manufactures to the exclusion of British manufactures of all descriptions." In another part of his evidence Mr Gott says, "If two pieces of cloth at 10s. a-yard were put before a customer, one made of British wool, the other of foreign wool; one would be sold, and the other would remain on hand; I could not execute an *order with it.* If any person sent to me for cloth at

7s. or 8s. a-yard, and if it were made of English wool it would be sent back to me, and I must resort to foreign wool, or foreign mixed with British, to execute that order." In fine, the British wool could not be got rid of without a copious importation of foreign wool to aid the manufacturer in his disposal of it, as fine cloths are so much better and more durable in their wear than coarse cloths, that they are coming more and more into demand, to the almost total exclusion of the latter. Moreover, the good old custom of making home-spun cloth is reviving among our farmers, and as it is excellently suited for work-day wear, though necessarily of an inferior gloss, coarse cloths will, to a considerable extent, cease to be the concern of our manufacturers. The only cloth, indeed, which the bulk of the people will require, will be a finer material to form the garb for Sunday and holiday recreation.

(60.) *Countries from which we derive our Wool.*—Our markets are supplied with foreign wool principally from the following places:—Australia, Van Dieman's Land, Cape of Good Hope, Peru, Germany, Spain, and Russia. The Tasmanian fleeces are preferred to the Australian, and fetch, in general, higher prices, owing to their being fit for combing, while the latter, though making considerable advances in fineness, are still of short staple. Both are favourites with our manufacturers, from their being firm in the pile, a quality resulting from the constant good health of the animal in those countries. The German wool takes precedence of the Spanish, and has done so since 1819 or 1820. The King of Spain, about the year 1800, presented the Elector of Saxony with a small merino flock,

and, from that period, our importations from Spain have diminished, as those from Germany have increased. From the period of its first introduction into Germany, till 1814, when peace once more fell to the lot of Europe, these sheep were gradually spread over the kingdom of Saxony, and when, by the events of 1815, the continental trade was thrown completely open, the Saxon dealers, perceiving the value of this new commercial article, commenced a regular trade in it with England. By this new supply, the Spanish wool, as here shown, was slowly beaten from its hold on the British manufacturers.

Importations into England of Wool from Spain and Germany, at three separate periods.

	1800.	1814.	1827.
Germany,	421,850lbs.	3,595,146lbs.	22,007,198lbs.
Spain and } Portugal, }	7,794,758lbs.	9,234,991lbs.	4,349,643lbs.

At these periods the ports of these countries were open to British merchandize, so that we have here a convincing proof, that the wool growers of Spain do not owe their losses, as supposed by some, to the hostile incursions of the French, but to the friendly competition of a neighbouring state.

Wool, both of coarse and fine quality, is daily becoming a more and more important export from the Black Sea, owing to the great range of pasturage in Southern Russia. The ordinary wools are very coarse, and the fleeces dirty and full of grass seeds. Though not subject to export duty, it is not supposed that it *will ever turn out* a lucrative article for the British manufacturer.

(61.) *Wool Trade from 1800 to 1830.*—The latest tabular accounts on which much reliance can be placed, are to be found in *M^r Culloch's Commercial Dictionary*, but of these I am compelled to offer only an abridgment, and in general nothing but the sum total of his detailed statements. The number of short-woolled sheep in England in 1800 was 14,854,299; the number of long-woolled sheep in England in the same year was 4,153,308. The quantity of British wool in 1800 amounted to 325,269 packs; while in 1808 it had increased to 414,502 packs. The sheep and lambs'-wool imported into Great Britain from foreign parts in 1810 was 10,914,137 lbs.; in 1815, 13,640,375 lbs.; in 1820, 9,789,020 lbs.; in 1825, 43,795,281 lbs.; in 1830, 32,813,059 lbs. The increase here observable in 1825 is accounted for above in our notice of the state of the taxes before and at that period. The exports of British sheep and lambs' wool in 1830 amounted to 2,951,100 lbs.; those of woollen and worsted yarn to 1,108,023 lbs. By far the larger proportion of these exports was intended for France and the Netherlands. The number of persons employed in the manufacture is estimated at from 480,000 to 500,000, and their wages at £9,600,000. The value of the raw material is calculated at £6,000,000; the total value of the manufactured articles at £18,000,000 (as wool is supposed in general to be trebled in value by passing through the hands of the manufacturer); and the interest on capital, sum to replace wear and tear, and manufacturers' profits at £2,400,000.

(62.) *Wool Trade in 1832 and 1835.*—"The total number of pounds of sheep and lambs' wool imported

into the United Kingdom, in 1832, was—foreign, 28,128,973; produce of the Isle of Man, 13,516; quantity retained for home consumption, charged 1d. per lb. duty, 23,619,901; ditto $\frac{1}{2}$ d., 1,571,328; ditto 6d. (red wool), 1,130; duty free (produce of British possessions), 2,473,991; total retained for home consumption, 27,666,350; total quantity re-exported, 555,014. Quantity of foreign wool warehoused under bond, 5th January, 1833, 3,165,651. The total quantity of British wool and woollen yarn exported from the United Kingdom in 1832 was, of the former, 4,199,825 lb.; of the latter, 2,204,464 lb. The exportation of British woollen manufactures in 1832 was as follows:—Cloths of all sorts, 396,661 pieces; napped countings, doffels, &c., 23,453 pieces; kerseymeres, 40,984 pieces; baizes, 34,874 pieces; stuffs, woollen or worsted, 1,800,714 pieces; flannel, 2,304,750 yards; blankets and blanketing, 1,681,840 yards; carpets and carpeting, 690,042 yards; woollens mixed with cotton, 1,334,072 yards; stockings, woollen or worsted, 152,810 dozen pairs. Sundries, viz., hosiery, rugs, coverlids, tapes, and smallwares, £55,443 1s. 8d. value. Declared value of British woollen manufactures exported, £5,244,478 10s. 10d.”*

“The total quantity of wool imported into the United Kingdom, in the year 1835, was by weight 42,208,949 pounds, which is rather more than 4,000,000 pounds under the importation of 1834; but on the 5th January, 1835, 6,494,266 pounds remained warehoused under bond; whereas, on the 5th January, 1836, there were no more than 2,846,014 pounds so locked up. This is

* *Quarterly Journal of Agriculture*, No. 24.

an important difference of stock on hand, which, no doubt, has tended, and will tend, to keep up the price of the article. The country from which we import the greatest quantity of wool is Germany. In 1835, the amount was nearly 24,000,000 pounds weight. From Russia, to which our exports of manufactured woollens is comparatively small, we imported upwards of 4,000,000 pounds; from New South Wales and Van Dieman's Land, taken together, about 209,000 pounds weight more than from Russia. The next largest importations are from Spain, Turkey, and Italy, which, taken together, supply us with nearly 4,000,000 pounds. Portugal furnishes 683,000 pounds; Holland, 201,000 pounds; and Belgium, 231,000 pounds. Of the foreign wool which we have imported, we re-exported in its unmanufactured state 4,101,700 pounds during 1835. And of the total quantity imported in 1835, we retained for manufacture 41,718,514 pounds. This is nearly 1,000,000 pounds more than was taken up by the manufacturers in the preceding year.

"The whole amount of British wool *exported* in 1835, was 4,642,604 pounds, and of this 3,000,000 pounds were sent to Belgium, and 1,500,000 pounds to France.

"In 1835, the 'declared value' (which, be it observed, is a real thing, and very different from the 'official value,' which is of no use except as an indication of quantity)—the total declared value was £6,840,511; and of this amount upwards of £2,600,000 worth of woollen goods went to the United States alone. Next after the United States in the scale of our customers for woollens comes the East Indies and China. To these we send the value of upwards of £300,000; to

our North American colonies the value of £418,000 ; and to the West Indies, £114,200 worth.

“ In Europe, our best customer is Germany, which, in 1835, took £631,000 worth. Besides the more fully manufactured goods, Germany took from us, in the same year, 1,191,000 pounds weight of woollen yarn. Of European customers, next after Germany come Portugal, which took, in 1835, to the amount of £368,000; Holland, £245,629 ; Italy, £243,582 ; and Belgium, £123,727. Russia took only £93,025 worth of woollen goods. The South American States begin to be good customers ; Brazil took, in 1835, £337,788 worth, and Mexico and other States, £356,700 worth.

“ Looking at the aggregate, the export of 1835 was fully a million sterling in value above that of 1834 ; but as the price was higher in 1835, this is no certain guide to the proportion of increase in *quantity*. In the year 1835, we exported to France only £68,000 worth of woollen manufactures.

“ We have already stated the *exports* of woollen goods to the South American States in 1835 ; the *import* of unmanufactured wool from these States in the same year was £2,176,000 pounds ; from France it was 104,000 pounds.

“ We have only to add, as fiscal information connected with the foregoing analysis, that of the wool imported in 1835, 26,877,780 pounds paid to the revenue a duty of a penny per pound ; 10,198,526 pounds paid one halfpenny per pound ; and 6,397 pounds of ‘ red wool ’ paid sixpence per pound.

“ *The wool imported from British possessions does not pay duty. Of that there were, in 1835, 4,635,811 pounds imported.*”

CHAPTER IV.

IMPROVEMENT OF THE BREEDS.

(63.) THIS subject requires for its due consideration some slight attainments in anatomy and physiology, but as such attainments, slight though they may be, are as rarely met with as required among the bulk of mankind, so the want of them may be the less regretted, seeing it is possible to render even the intricacies of the study plain and simple, by an appeal to facts of every-day occurrence ; which, having attracted the notice of the most unthinking, will serve as hooks on which I shall try to hang the better part of an interesting inquiry.

(64.) *Early Improvers of Sheep.*—There cannot be a more certain sign of the rapid advances of a people in civilization and prosperity, than increasing attention to the improvement of live-stock. It tells of a population limited in regard to soil, and making every effort to remedy the want, by an economical doubling of the return for the usual outlay : for, while a tribe wanders at large, remaining at a particular place only so long as provender holds out, and, striking the tent, departs for some far-off field, so long will their flocks be suffered to roam neglected, and flourish or decay, as chance directs.

From the time of Jacob, the possibility of determining the nature of the offspring, by impressions on the parents, has been apparent to all ; and the best means of perpetuating a good quality, or removing a

bad one, have continued from time to time, to occupy the attention of patriotic individuals. As much appears to have been known about sheep two thousand years ago as at present, so true is it, that nothing new is to be met with ; yet, that does not rob our modern improvers of their merits, for though they deserve little as inventors, they are to be admired for that strength of mind, and determined perseverance, which enabled them to rouse their fellows from their lethargy, and compel them to become in turn, benefactors of their country, and themselves. The signs of a good ram are concisely laid down by Varro, by Virgil in his third Georgic, and by Columella ; and, though the Spanish nobility were looked upon with wonder, (till eclipsed by our own extravagance,) in giving two hundred ducats, or fifty pounds for a ram ; yet Strabo assures us, that in his day (under Tiberius), they gave more than three times that sum for one of the breed of the Coraxi, a Pontic nation, believed to have the finest fleece in the world.

The greatest recorded improvers of the sheep in ancient times were Lucius Columella, and his uncle Marcus Columella, Spaniards of distinction, who removed to Rome in the reign of Tiberius, and made agriculture the study and business of their lives. The former commenced his celebrated treatise on husbandry during the reigns of Tiberius, and Caligula, and appears to have finished it A. D. 55. It is a work which may be read with advantage even at present, as it abounds with much that is valuable, and is accessible to *all through its English translation.**

* I allude to this, as the author of the work on Sheep, published by

(65.) *Modern Breeders*.—It is only within a very recent period, that the mode of improving live-stock by skilful breeding, has been properly attended to. The perfection of breeding formerly, was to have cows in calf once a-year, and rear calves on as little milk as possible ; and, even yet, there are only a scattered few who devote to it the attention it requires. The first, in modern times, who arrived at any thing like eminence in this department, was Joseph Allom, of Clifton, who raised himself by dint of industry, from a ploughboy, and for a long time contrived to keep his methods secret, being supposed by many to have bought his ewes in Lincolnshire, at the very time he was constantly bringing them from the Melton quarter of Leicestershire. Though possessing talent, he does not appear to have had education enough to avail himself of it, and accordingly never gained the extensive popularity which fell to the lot of his successors.

As the introducers of new and important plans of management in agriculture, are always rewarded by large profits, and the gratitude of their countrymen, so none were ever more generously dealt with in either respect, than Mr Robert Bakewell, of Dishley, and Mr Ellman, of Glynde. The former, who may be said to have created a *variety*, considered that a tendency to acquire fat was the first quality to be looked to in an animal destined for the food of man ; and on this, with him a fundamental principle, was based the whole of

the Society for the Diffusion of Useful Knowledge, at page 123 of that book, laments the want of an English translation of Columella. An excellent quarto translation of his twelve books on Husbandry, and one on *Trees*, was published at London, in 1745.

his proceedings. Different opinions will of course be held on the merits of the theory on which he acted; but all must acknowledge, that we are indebted to his skill and experience, for the exertions which have been subsequently made to improve the qualities of live-stock, in every district of the kingdom. It was by his example, in fact, that the farmers all over the country were stimulated to exertion, and be the system bad or good, it ought to have our veneration, seeing that it was the commencement of a new and most important agricultural era.

John Ellman derives his well-earned fame, from the zealous manner in which he improved the Southdown sheep, and spread them through the empire. Till he directed his attention to the subject, every thing connected with the management of the flock was left to chance, or at least to the guidance of farm-servants, with whom, of course, it could not be a matter of interest to select, or *sort*, suitable animals for the continuance of the race. He speedily, however, corrected this mismanagement, and aided by the introduction of turnip-feeding, in no long time, and without any admixture of foreign blood, materially improved the breed.

About seventy years ago, improvements also commenced in Scotland. Till then, in many parishes, no farmer could keep sheep through the winter, and no place was reckoned so fatal to these animals as the undrained, and unsheltered parish of Eskdale-Muir, in Dumfriesshire. At last one William Bryden rented the farm of Aberlosk, and soon, by the *original* plan of draining, and building stone enclosures, made it, to use the words

of his able biographer, Mr Scot of Selkirkshire, "like the land of Goshen, good for cattle which it is to this day."

(66.) *Varieties among Animals*.—All organized matter is subject to variety. It may be doubted whether, since the creation of the world, there have ever occurred, either at the same, or at separate periods, two individuals in every respect perfectly alike. A plant, or an animal, may resemble the rest of its species in chemical constitution, and in the number and situation of its organs, but is sure to differ from all in size, general configuration, and disposition of its parts: These shades of difference, endless though they are, may be referred to two leading causes—climate and descent; the former embracing deviations induced by temperature and resources of subsistence; the latter including changes occasioned by management, modes of breeding, and influence of sex.

(67.) *Varieties induced by Temperature*.—The influence of temperature extends chiefly to the *colour* and *development* of animals. In cold regions the skin of the human race is fair, and the person squat and stunted, but as we approach the equator, the hue becomes deeper and deeper, till it is jetty black, while at the same time, the stature attains nearer and nearer to the tallest proportions to which mankind seem naturally entitled. The animals of the arctic regions are, for the greater part of the year, covered with a clothing of the purest white, which is, however, in many of them, abandoned for one of deeper tints as the solar heat begins to gain the ascendant. But how very different do we not find the colours of intertropical

animals. There vivid tints, and an almost metallic lustre, pervade animated beings, from the coral in its submarine abode, to the gallinaceous birds, the cox-combs of the forest. In this, as in every other department of nature, the most beautiful harmony, or, in other words, a union of what is pleasing to the eye, and suited for the comfort of the creature, every where prevails. The colour of an animal envelope is never at variance with the tints of surrounding objects. A painter, for example, would not place a flower or animal of brilliant hue amidst the monotonous aspect of an arctic landscape ; neither would he picture the faintly-tinted beings of a polar latitude, as surrounded by the warm and flashy colouring characteristic of an oriental climate. As temperature, then, determines in a marked degree the colour and dimensions of every animal, such variations render the division of living beings into races and varieties, a matter of necessity. Thus all human beings belong only to one species, which may, however, be divided into five races, and these again into an infinity of varieties. The differences between a race and a variety are, that the latter is a subdivision of the former, and that in the former the modifications are more profound, the changes not being confined to the surface, but extending to the frame-work of the body ; whereas, to constitute a variety, nothing more is necessary than the superficial influence of heat and light on the skin, and its appendages the hairs. The Negro and the Abyssinian are precisely similar in colour, yet they are by no means of the same race, as their different features will *distinctly* prove ; the Abyssinian approaching as much

in cast of countenance to the European, as the negro does to the higher orders of the ape. The same may be noticed among sheep, but this is sufficient for the present.

The changes induced by climate, result from the working of a power inherent in most animals and vegetables, by which they are suited within certain limits, for bearing up against removal from their ordinary localities, and assuming a different cast, as the place of their exile may differ in degree from that which they have left. This gradual adaptation to circumstances by an accommodating power is termed, in philosophical language, acclimation.

(68.) *Adaptation of the Sheep to Climate.*—No animal varies more than the sheep, and none so speedily adapts itself to climate; it would almost appear that nature, convinced of its great utility, had bestowed upon it a constitution so pliant, as to enable it to accommodate itself to any point in a wide scale of temperature; for though its natural situation as a wool-bearing animal, like that of man appears to be the wine countries, yet with him, it has spread to every quarter of the globe, becoming impressed at every change with some peculiarity, alterable only by a change of situation, and varying, we might almost affirm, with the weather; for, where the temperature is equable, there does the animal preserve unchanged an atmospheric stamp, and defies our efforts to alter the breed; while under a fluctuating sky we can model it at will, though in this case, continued exertions are required to secure them for any length of time in an undeviating course.

spring will thrive, proving large and vigorous, and every way worthy of being placed at the head of its species. These are, however, cases where the transition is from an extreme of heat or cold to a temperate atmosphere. Witness what Mr Dawson, the manager of the Australian Agricultural Company, says in his private journal (quoted in *Cunningham's New South Wales*). "Both the climate and the soil appear by nature intended to produce fine wool, and fine animals too, *even from the worst beginnings*. The latter seems a paradox. The extensive range afforded to every animal keeps it in good condition, and, perhaps, the natural grasses may have more of good in them than their appearance indicates. However this may be, the climate clearly has a wonderful effect on the size of all animals, even upon man, who is universally tall here, though born of diminutive parents. From this I am led to believe, that the climate governs chiefly, and thus every breeding animal introduced here will attain a size not known in Europe."

(71.) *Extent of the Alterations produced by Climate.*—Changes occasioned by climate are always limited to the fleece, horns, and disposal of the fat, and never extend to those parts, on the permanence of which the animal depends for its station in the scale of being, as the feet, teeth, and digestive organs. In tropical countries we find the fleece approaching more to hair than wool, as in the sheep of Thibet, so celebrated for the silky nature of their coat. Burchell remarks, that the skins he brought from the Cape of Good Hope were often taken for those of an unknown quadruped, *from the furry nature of their wool*, if such it can be

called, and thinks it is owing as much to the pasture, which is well adapted for giving these animals a soft and useful *fur*, though not suited, like New South Wales, for the growth of the finest wool, and that the colony might turn this to great advantage. In cold regions the hairy covering is more developed and fully coarser, but always mingled with a proportion of hard rough wool. The influence of climate on portions of the fleece and skin is well illustrated by circumstances which have occurred in Galloway, even within the limits of our traditionary writings.* The native sheep of the Highlands of that district is supposed to have been a small, handsome, *white-faced* breed ; at least so thinks John MacLellan, who wrote an account of Galloway in 1650, from the wool being much praised, and eagerly bought up by merchants, which would not have been the case if taken from the *black-faced* animal ; yet how happens it that at present the native breed exists only in the lower parts of Kirkcudbrightshire, the high country exhibiting *black-faced* sheep, which, after every trial, have been found best adapted to the climate, and pasture of the moors and Highlands ; while Chalmers owns that it has not been ascertained when or whence this hardy breed were brought to their present locality ? Why, it is tolerably plain, that though the *white-faced* sheep might be placed there originally, yet they would speedily lose every trace of their origin, and become *black-faced* when placed on a hilly country, and subjected to the slow but certain influence of peculiar food and climate.

* Chalmers' Caledonia — Article, Galloway.

Mr Culley imagines, that the dun-faced sheep were the earliest tenants of the Scottish hills, but so far as my researches extend, that supposition is entirely contradicted. Chalmers remarks, that the black-faced animals superseded the goats, which were at one time a source of subsistence to the farmers, and it is exceedingly probable, that as the old white-faced began to change their appearance, and became gradually able to withstand the rigours of a mountain fare, and winter under a dun skin, and short rough wool, so would they recommend themselves as the best of all stock to the hard-driven agriculturalist.

(72.) *Increase of the Number of the Horns.*—As much wonder is sure to be excited by the fact, that bony prominences are subjected with as great certainty to the modelling hand of climate as softer parts, I give the following from a recent work, entitled, "*Gardens and Menagerie of the Zoological Society Delineated*," premising, however, that, in my opinion, temperature has a vast deal more to do with alterations in the horns than domestication or cultivation. "One of the most curious modifications produced by cultivation in the domesticated sheep consists in the augmentation of the number of its horns; two, three, or even four supplementary appendages of this description being occasionally produced in addition to the normal number. Under these circumstances the additional horns usually occupy the upper and fore part of the head, and are of a more slender shape, and take a more upright direction than the others, thus approaching in character to those of the goats, while the true horns retain more or less of the spiral curve that distinguishes those of the sheep.

There exists a strong tendency to the propagation of this monstrosity, which is extremely frequent in the Asiatic races, but is also met with in a breed that is common in the north of Europe, and is said to have been originally derived from Iceland, and the Feroe Islands. In this case it is unconnected with any other anomaly, but in the flocks of the nomad hordes of Tartary, it is usually combined with an enlargement of the tail, and adjacent parts, by the deposition of fat, frequently to an enormous extent."

(73.) *Causes of the various forms of the Horn.*—

Horns are seldom met with in the sheep of hot climates, occurring more frequently in cold and temperate regions; thus following closely the development of the other coverings, to which, as before stated (19), they are strictly analogous. The fleece consists of two portions—hair and wool, the one predominating more or less over the other, as the climate may direct. The form of the horns is always in unison with the character of the fleece: thus, if the animal is covered with hair, as in the goat, the horns will be straight; but if it is clothed with wool, as in the sheep, the horns will be curved. The same holds good in other animals. The reason of this appears to lie in the tendency which the hair or wool, constituting the horny sheath, has to model the form of the supporting bone. The fibre of hair is nearly straight; that of wool is, on the other hand, remarkable for the number of tufted curls, or small spiral ringlets, into which it naturally contracts; so that a Merino ram, for example, will never be found with rectilinear horns, nor a true goat with *twisted ones*. The truth of these remarks is borne out by ob-

servations on animals on whose heads more than two horns are occasionally met with. We always in such instances notice, that the additional horns are straight, thus indicating the presence of a considerable quantity of hair among the wool. The curve will be more decided, and the twists more numerous, in proportion as the fibre comes nearer and nearer to a perfect wool—evidence of which we have in the beautifully-tufted and spiral horns of the Merino ram, which are as opposite in this respect to those of the goat, as is its fleece to the hairy coat of the latter. From these considerations I am led to believe, that the form of the horn, when present, is an excellent guide to the nature and quality of the other coverings, and an index to every gradation which can possibly occur between wool and hair.

(74.) *The proper Temperature required for Sheep.*—Regular warmth is absolutely necessary for the production of a good animal and a fine fleece, and is only to be obtained by attending to the draining and clearing of land, so as to dissipate moisture, and allow currents of air to play freely across the country.* An atmosphere which holds suspended a large quantity of watery vapour, is always extremely chilling to an animal body. This is accounted for by the well-known fact, that a moist air, being a better conductor of caloric than a dry one, robs an animal more quickly of heat. Thus, in passing from the dry air of the hills into the

* It is to secure equality of temperature that the Spanish flocks are twice in the year exposed to the hazard of an overland journey of 400 miles, that they may pass the summer in the mountains of the north, and the winter in the southern plains.

vapour of the valleys in a winter morning, we feel as if the transition had been from a temperate to an icy region. Hence one of the reasons why sheep thrive best in a rather elevated situation. Moist air, however, is exceedingly oppressive in hot weather, because evaporation, from the surface of the body, is to a great extent diminished; and it is only by the perspiration being allowed to escape rapidly, and to convey away the heated particles, that we can manage to be in any degree comfortable during the heat of summer. This free evaporation we endeavour in every way to obtain, and often in a manner that ignorant people would consider as the reverse of sensible. It is well known that draughts of *cold liquids* are very far from answering the purpose of lowering our temperature when above a pleasant standard; but we find that a basin of *hot soup, or tea*, will speedily bring about the desired end, by producing a copious determination of fluid to the skin. Yet, if the air contained no moisture, we should experience sensations just as unpleasant as those already mentioned; for evaporation from our bodies would proceed at such a rate, that we would soon be parched. It is to counteract this tendency of dry air that the Americans are in the habit of placing a small vessel of water on their stoves, by which contrivance a quantity of vapour is diffused through the apartment, sufficient to balance the loss from the arid warmth of the fire.

That an equable temperature is only to be obtained by draining and clearing a marshy and wooded country, is sufficiently authenticated. In the thickly wooded and swampy territories of Guiana, rain falls continually

during nearly eight months of the year; and the cold is so intense, that fires are necessary in the houses throughout the night. But in Cayenne and its neighbourhood, which were cleared of wood about one hundred and fifty years ago, the increase of temperature is now so great, that during the night the people are annoyed by the warmth, and the rains are neither so frequent nor so heavy as in the rest of the country. Paris and Quebec are nearly under the same latitude; yet the air of the latter is much colder than that of the former, evidently from its being surrounded by forests so dense and umbrageous, that sun and wind are alike denied access to the earth. The difference between a cleared and an uncleared country, in regard to wool, is well illustrated, by contrasting North America, its heavy woods and stagnant atmosphere, with the thinly timbered surface and constantly renovated air of New South Wales. It is only within the last few years that Canada has been enabled to compete with Britain in the article of wool, and that the sheep, which were of the coarsest kind, have been so improved as to do away with the prejudices against their mutton. Australia, on the other hand, has, from its earliest colonization, figured as a sheep-rearing country of the first importance; and nothing has conduced so much to this as its freedom from closely planted trees, by the absence of which the settler is enabled at once to stock his farm with the best of sheep. Nature, in fact, could never have intended sheep to pasture in a wooded country, as is clearly evinced by their coat, to which every thing in the shape of bush or tree is in the highest degree *inimical*.

(75.) *Geographical limits of the Sheep.*—Every plant and animal has certain geographical limits, out of which it cannot exist. With the exception of man and the dog, no animal has a wider range than the sheep, extending as it does from Iceland almost to the equator, and from a few degrees south of that to the polar extremity of South America. But though existing under so great a variety of exposures, it must not be inferred that it can come to perfection in them all. On the contrary, it rather delights in the temperate zones, and can evidently only be raised to its highest point of excellence in the countries of the vine. The western parts of continents produce better sheep than the eastern, and the southern hemisphere better than the northern; as in the former situations the temperature is more nearly equable than in the latter. The same may be said of maritime districts, as compared with such as are inland. Temperature is affected in the same way by elevation as by northern or southern position—the mean heat diminishing in the same ratio when ascending a mountain, as in receding from the equator. On this account, Humboldt compared the earth to two mountains with their bases at the equator, and their summits at the poles. The mean temperature, when resulting from the height of the place above the level of the sea, is at the same time influenced by the nature of the aspect, as we notice in the Alps, where the Glacier exists on the northern side, at the same elevation at which the vineyard yields a perfect fruit upon the southern.

(76.) *Particular forms induced by certain limits.*—The character which a predominance of heat, or cold,

impresses on the animal as a whole, extends also to individual parts of the body. The sheep of South Africa are, as all the world know, remarkable for the magnitude of the tail, which forms an immense fatty appendage. The sheep of Persia, Tartary, and China, are distinguished from all others by the tail forming a *double globe* of fat. The North of Europe, and North of Asia, are overrun by a breed in which the tail is almost wanting, while that of Southern Russia, India, and Guinea, stands pre-eminent from the elongation of the tail, and, in respect to that of the two last named places, also of the legs.

(77.) *Influence of vegetation on form and disposition.*—Vegetation influences, to a great extent, the form and disposition of the animal. Such changes may be brought about either by the plenty, or scarceness, of the herbage; or by the nature of the country on which that herbage is produced. Animals found on hilly countries are always widely different from those of the plains. Their bodies are light, their legs long, and their habits of that unquiet kind which renders them hostile to any thing like restraint. It is for these reasons, that when once a flock attaches itself to a range of hills, and becomes suited to the means of subsistence, it may preserve itself for ages apart from neighbouring varieties, and present, after a long series of years, those qualities in their native purity for which it was noted by the earliest observers. The sheep of a level country are distinguished, on the contrary, by heavy bodies, short legs, and easy tempers. They are, in fact, constructed on Dutch proportions, and are imbued, as a *natural consequence*, with those imperturbable and

steady-going habits so characteristic of the bulbous-bottomed Hollander. Subdued as they are by the nature of their locality, they readily submit to man, who tutors them at will, and works on them those profitable changes from which have originated our improved varieties. As connected with the unquiet dispositions of hill sheep, I may mention the prevalence of a notion, that domesticated sheep cannot by any possibility become wild. From all that I have seen, and read, I am led to believe, though the sheep, according to Greek, Roman, and Oriental philosophers, was the first animal domesticated, that when at liberty it will soon return to its primitive and instinctive habits. Bonycastle, in his work on Spanish America, remarks, that sheep are found in a state of nature, in the northern parts of New Spain, "having multiplied to an extraordinary degree in the wide-spread plains, and savannahs." In ascending our Scottish mountains, every one must observe the state bordering upon wildness, in which the sheep appear, roving in detached but well-led parties; bounding away to the most inaccessible places on the approach of danger, and peering from the eminences in all the pride of scornful independence. Professor Blumenbach at one time doubted the possibility of domestic sheep ever becoming wild; but his opinion was changed on perusing the work of Vincentius, where there occurs a remarkable passage, in which Nearchus, when speaking of the desert island of Cataia, on the coast of Caramania, says, that the inhabitants of the neighbouring islands yearly carried thither sheep, as offerings to Venus and Mercury, and that, in course

of time, they became wild in the deserts.* Constant attendance is, therefore, called for on the part of man, to ensure that untroubled reliance on his care so conducive to the welfare of the flock, for even on a temporary cessation of his protection, those instincts, which can be subdued but not eradicated, are brought into operation, and their presence will go far to retard the advancement of those qualities, on the perfection of which a profit can alone be hoped for.

(78.) *Breeds required for Britain.*—Of the numerous breeds at present in our island, a few only are indispensably necessary for the continuance of its prosperity. These stand, according to Marshall, thus:—A very long-woolled sheep, as the Lincolnshire, or Teeswater, for the richest grass lands, and finest worsted manufactures—the New Leicester, for less fertile grass land, and for rich enclosed arable land, on which the fold is not used; intended to supply coarser worsted, stockings, coarse cloths, blankets, and carpets—a middle-woolled breed, as the Wiltshire, the Norfolk, or the Southdown, for arable lands on which folding is practised, and for cloths of middle qualities—a fine-woolled, as the Ryeland, for the finest cloths; and a hardy race for heathy mountains.

Some argue, and rightly, that only three breeds are necessary for Scotland, inasmuch as only three are required by the nature of the country. Scotland may be regarded, in an agricultural point of view, as divided into highland, upland, and plain. The highland con-

* Edin. Philosophical Journal.

sists of primitive rocks, covered by peaty soil and heath, on which these indefatigable gleaners, the black-faced sheep, alone can gain a subsistence. The upland is formed by the transition series of rocks, covered with grass; and to it the Cheviots appear indigenous. The plain is formed by alluvial deposits, covered with rich pasture, and capable of supporting races of large sheep, as the Leicesters.

Sheep are the only kind of live-stock which ought to be kept in mountainous districts, especially when green crop cannot be cultivated. Sheep-farming must necessarily prevail in the Highlands, where there are few tracts suited for the pasturage of black cattle: The value of its adaptation to the natural circumstances of that district is proved by the rapid progress which it made, and the profits which resulted to the individuals with whom it originated. Places which formerly were not of the slightest utility, now yielded heavy rents. The spots among the mountains, susceptible of cultivation, were found to be advantageously kept in grass, to serve as pasture for the flock during the rigour of winter, and it was well ascertained that more than double rent might be paid by stocking with sheep in preference to cattle.

The Dishley sheep are excellent specimens of what may be done with the form of an animal, when the endeavours of the breeder are seconded by a pasture suitable for the intended breed. They are admirably adapted, as every breed ought to be, to the soil and situation where they were called into existence; and their crosses are now spread over most part of the country; principally the corn districts, as they are supposed

to be the most profitable kind on farms where the best tillage crops are combined with the fattening of live-stock, though Marshall supposes they will only be profitable so long as other breeds of long-woolled sheep remain with thin chines, and loose mutton ; or, in other words, that there are plenty of kinds which would prove equal, if not superior, to the present, if they only received the same studied attention.

(79.) *Varied nature of the food of Sheep.*—Sheep will take, sometimes from choice, sometimes from necessity, to food of a directly opposite nature to what they have been used. “The mutton,” says the Rev. George Low, writing of Orkney, “is here in general but ordinary, owing to the sheep feeding much on seawe, to procure which these creatures show a wonderful sagacity, for no sooner has the tide of ebb begun to run, but they, though at a great distance, immediately betake themselves full speed, one and all, to the shore, where they continue till it begins to flow.” The sheep of Iceland are content during severe winters to feed, and be preserved, on messes of chopped fish-bones, being all that the ingenuity of their masters can provide in the way of a precarious sustenance. During the long continuance of snow-storms, when the herbage is beyond the reach of their utmost efforts, sheep are known to devour the wool on each other’s backs, and, in some instances to acquire a relish for this unnatural food, which adheres to them through life. This, though on first thoughts hardly credible, is scarcely more wonderful than the partiality which cows display, when instigated by the depraved appetites created by pregnancy, for blankets, and any similar domestic articles

which may be exposed to the gratification of their longings.

The Puruk sheep of Ladusk, in the Himalaya mountains, is, as described by Mr Moorecraft, in the *Transactions of the Asiatic Society*, in respect to the varied nature of its food, a most remarkable animal. "The Puruk sheep, if permitted, thrusts its head into the cooking pot, picks up crumbs, is eager to drink the remains of a cup of broth, and examine the hand of its master for barley, flour, or a cleanly picked bone, which it disdains not to nibble; a leaf of lettuce, a peeling of turnip, the skin of the apricot, give a luxury; and the industry is indefatigable with which this animal detects, and appropriates substances, so minute and uninviting as would be unseen and neglected by ordinary sheep; perhaps the dog of the cottager is not so completely domesticated as it is." That Mr Moorecraft is correct in this statement of its omnivorous propensities, there cannot be the slightest doubt, as any farmer can testify from what he has seen of lambs reared by children for amusement. The celebrated John Hunter showed, that a pigeon might be made to live on flesh, and that its stomach became adapted to the nature of this food: and I have somewhere read of a sheep, which, after being long on ship-board, and accustomed, from scarcity of vegetables, to an animal diet, could never after be prevailed upon to take to grass. Nor need these circumstances excite surprise, since the food of every living creature is, for a certain period at the commencement of existence, limited to such as is purely animal. But to keep to our subject. Those in the habit of opening the stomachs of sheep, must have remarked

the eroded appearance which the inner coat occasionally presents. This phenomenon is owing to the action of the gastric juice, which, if competent to turn at once from the food with which it is mingled to attack the texture which has secreted it, will also be, during life, capable of digesting with tolerable ease, such dead animal matter as may be brought into contact with it.

In regard to vegetable food, they will, when necessary, devour such as is even of an acrid nature, and calculated to poison any animals but themselves. Thunberg, while in Southern Africa, frequently noticed sheep eating, with impunity, the *Mortimia acris*, the *Rhus lucidum*, and the *Lycium afrum*, which are all of a poisonous nature ; and, in this country, hemlock is known to be quite innocuous to sheep. What is poison to one animal often constitutes a wholesome food for others, and that which will, when given in immediate large doses, destroy an animal, will, when taken in a gradually-increasing allowance, prove extremely salutary.

(80.) *Influence of the food on the quality of Mutton.*
—Diet has a powerful influence on the constituents of the body. A rank succulent pasture taints the flesh, or renders it insipid and unpleasant, while a dry aromatic herbage communicates a delightful flavour, and enables people versed in the pleasures of the table easily to discriminate between turnip-fed and grass-fed mutton ; and again, between the latter, and that which has spent its existence on the hills. In Touchwood's Syllabus of Culinary Lectures, appended to the *Cook and Housewife's Manual*, by Mistress Dods, we are briefly informed, that " the black-faced, or short-sheep,

are best for the table, though *more depends on the pasture than the breed.*" More, in fact, depending on feeding and management, than on the variety of the animal, though this of course is not to be neglected. A notion has been advanced in this country, that artificial pastures are less nutritious than natural ones, and that the animals which are raised upon them are, consequently, of a laxer fibre, and the flesh less wholesome, as well as less savoury. This, I have no doubt, is perfectly correct, as many *diseases* may be traced to such improper food, and what is calculated to produce in some cases actual disease, cannot fail to prove at all times capable of retarding the advancement of the animal. These soft succulent pastures appear not to be positively poisonous, but to be negatively so from their deficiency in saline matter ; the rapid growth of the plant preventing the elimination and absorption, of many of these ingredients with which the soil abounds. This is proved by the greater necessity which exists for the use of salt in the food of the herbivorous animals of hot climates, than in that of such as inhabit temperate, or cold latitudes ; vegetation being in the former more rapid in its details, and in certain states of the atmosphere hurried in the extreme, while in the latter the process proceeds with that leisure which enables the plant to make good the measure of its constituents, as it increases in size. In many parts of North America it is well known, that, at certain seasons, the wild animals make eagerly for the salt *licks* ; and, following up this hint, the settlers easily induce their oxen to keep near their dwellings, by serving them periodically with salt. When the wild cattle of South America had

greatly increased, it was discovered that they could not exist unless they had access to streams which had acquired brackish particles from the soil. *If salt, in places devoid of it, was not furnished to them by man, they became stunted, unfruitful, and the herds soon disappeared.* Even in this country, the free use of salt is found to be highly beneficial to our domestic animals, preventing the occurrence of many of those diseases which are otherwise sure to follow the use of food such as is mentioned above, and ensuring that sound health which is so conducive to the accumulation of fat.

(81.) *Differences in the quality of Mutton.*—I shall now enter a little into the manner in which the *quality* of the flesh may be affected, and the methods of judging of the different states or conditions, in which it may be found under various circumstances ; premising that it requires much experience, to enable a person to pronounce with confidence, as to the value of the muscular parts, from the inspection of a living animal :—The flesh of different specimens of the same animal, varies not so much from breed or descent, as from age, feeding, and exercise. That of the young is soft and gelatinous, the fibres being small, weak, and much interspersed with a substance termed, from its loose appearance, cellular tissue. This tissue exhibits in the spaces between the muscles (*layers of flesh*) small masses of delicate fat. The greater bulk of the latter is situated immediately beneath the skin, and occasions that beautiful rotundity so much admired in children. As the animal advances in life, the fibres become firmer, larger, and more *approximated*, the cellular tissue disappears to a great

extent, the fat shifts from the outward to the inward parts, allowing the outline of the muscles to be distinctly seen, but giving at the same time to the figure that portly symptom of good keeping, so unpleasant to the eye when carried to the extent of Aldermanic dignity. All these appearances are, however, varied by exercise, which tends, in a marked degree, to increase the muscular parts at the expense of the fat—the former becoming, when employed within proper limits, large, and unyielding to the touch, while at the same time the colour is heightened from a pale or purple hue, to the bright vermilion so justly relied upon by housewives, as a guarantee for the superior qualities of the article. The wild horses in South America, which form the principal part of Indian diet, are said by these epicures to be much improved for the table by gentle labour, and to be quite on a par when thus cared for, with some of our best beef. This plan is, however, only pursued for the purpose of rendering the flesh of their horses moderately firm; but where an opposite effect is desired it is readily, though cruelly, produced by putting the animal to a lingering death; examples of which practice are to be met with in the annals of most civilized nations; as in the German mode of whipping pigs, and the English custom of baiting bulls;* both tending to the same end, by so exhausting vital contractibility as to prevent its last and faint display in the stiffening of the carcass.

Marshall, who touches very slightly on the subject, says, “The flesh of sheep when slaughtered is well

* By the old English law, no bull beef could be sold unless the bull had been baited.

known to be of various qualities : some is composed of large coarse grains, interspersed with wide empty pores, like a sponge ; others of large grains, with wide pores filled with fat ; others of fine close grains with smaller pores filled with fat ; and a fourth of close grains without any mixture of fatness. The flesh of sheep when dressed is equally well known to possess a variety of qualities : some mutton is coarse, dry, and insipid,—a dry sponge affording little or no gravy of any colour. Another sort is somewhat firmer, imparting a light-coloured gravy only. A third plump, short, and palatable, affording a mixture of white and red gravy. A fourth likewise plump, and well-flavoured, but discharging red gravy only, and this in various quantities. It is likewise observable that some mutton, when dressed, appears covered with a thick, tough, parchment-like integument ; others with a membrane comparatively fine and flexible.” This membrane ought to be rather thin than thick, as, when of the latter texture, you may safely affirm that the animal was aged. *Looseness* is reckoned a bad quality of the flesh of sheep during life, as indicating a coarse-grained porous mutton, and as equally exceptionable with that of *hardness* : while *mellowness*, and firmness, are much to be desired, as forming a happy mixture, deemed by some the point of perfection. The tendency to become fat at an early age, though a valuable one in some points, is not so in others. Premature decay is always the result, showing with certainty that a healthy action has not been going on. An animal when *loaded* with fat cannot be looked upon otherwise than as in a diseased state, and liable to *embarrassment* of many organs, especially of the heart

and brain. Sudden death on any hurried exertion is far from rare, and life, from the difficulty of enjoying it, is any thing but desirable.

(82.) *Abuses in Feeding.*—The custom of over-feeding was carried to an absurd extent on the promulgation of Bakewell's method, nothing less being aspired to than the glory of laying seven or eight inches of fat on the ribs of sheep. This folly however had its day : the ridiculous parts of the system have to a great extent disappeared, while attention to the production of an increased quantity of mutton, without too great an abundance of fat, has remained to prove to the world the value of the benefits which the English farmer conferred upon his country. Overgrown sheep are indeed good for nothing "save" in the words of Meg Dods, "to obtain premiums at cattle shows, and deluge dripping-pans with liquid fat ;" and in this every one will agree, excepting always boarding-school cooks, and others who depend for their principal perquisites on the over-roasting of oily meat ! The fat, though not reckoned as offal in the slaughter-house, will speedily show itself as such in the kitchen, by the waste during the cooking process, even in England where fat meat is so much admired ; and it is surely absurd to pay the price of good mutton for tallow, when if the latter were really wanted, it could be procured at a cheaper rate by itself, than when forming part of a dear commodity. The only way in which over-fat meat can at all be reckoned profitable, is in its application to the wants of the working classes, whose bodily labour enables them to enjoy what would to others prove displeasing in the extreme, and to digest and

assimilate with ease, food which to the sons of sloth would prove a poison. So far as these wants have been supplied, the attempt of Bakewell has been attended with the happiest results, as he and his disciples have placed by their well-spent exertions much good food within the reach of the poorer classes, which they must otherwise have gone without ; while in many instances it has driven bacon from the market, being a cheaper and more palatable commodity, which cannot but contribute to the health of the people, seeing the continued use of salted meat is calculated to injure the body, and render it liable to many diseases. Marshall remarks, that fat, like charity, covers a multitude of faults : and he is right, for an ill-shaped animal if well fed, has all its angles speedily effaced, and if its ugliness has not amounted to absolute deformity, it acquires that rotundity of contour so pleasing to the eye, and so apt to mislead us.

The rapidity is various with which animals take on fat, much depending on hereditary predisposition, and the nature of the food ; and much also on the state of the atmosphere, and quiet habits ; a moist and rather warm air tending greatly to the advancement of the process, some birds becoming fat in twenty-four hours of wet weather. Children that have been emaciated by diseases often resume their original plump condition in a few days ; and animals that have been famished, as hogs, afterwards fatten very rapidly. Moderate and repeated bleedings, mild farinaceous diet, and emasculation conjoined, tend to the repletion of the body, and to the speedy deposition of fat ; yet it would *appear, that* when acquired in this rapid manner, it

never possesses the value in a culinary point of view, that is yielded to such as has been slowly formed, when, as one may say, the worthless particles have had time to be removed, and the remaining part to become a firm and healthy deposit. It is partly owing to this, that animals are never at their best when forced to take on fat at an early age, but are most esteemed by the gourmand when they, as in the case of the sheep, have lived from three to four years.

(83.) *Tendency to acquire Fat.*—A disposition to early obesity, as well as a tendency to that form which indicates a propensity to fatten, is materially promoted by a good supply of rich food, while the animal is in a growing state. The Spanish shepherds are so well aware of this, that half of the lambs are annually killed, that the survivors may obtain every indulgence in the way of milk. Care should be taken never to place animals suddenly on food much superior in feeding qualities to what they have left. Very lean sheep are never put to full turnips in winter, nor to rich pastures in summer, but are prepared for turnips on good grass lands, and kept on second years' leys, and afterwards given a moderate allowance of turnips if they are to be fatted on pastures. It is an invariable rule with all good managers, never to allow this or any other animal, reared solely for the shambles, to lose flesh from its earliest age till it is sent to the butcher, as more food is necessary to bring it to a certain condition than to keep it at it. In the case of the Dish-leys, it is customary to keep all in a state of fatness, except those intended for breeding, and after full feeding on turnips during winter and spring, to finish them

on the first year's clover early in summer, when the prices of meat are usually the highest ; so that this variety is always fit for market at eighteen months, while the Highland breeds, though prepared by means of turnips, a year at least, sooner than in former times, do not usually go to the shambles till from three to four years old.

(84.) *Frequent change of Pasture necessary.*—Sheep ought never to be permitted to remain too long on one pasture :—Great benefit will be derived from their removal from time to time to different parts even of the same farm, by which arrangement a change of herbage will be ensured. No animal can be kept for any length of time in health, if restricted to one unvarying routine of diet. This has been satisfactorily proved by the experiments of Majendie, who found that health could not be sustained on one or even two kinds of food beyond the thirtieth day. Now, though such immediate injury cannot result to a flock from retention on a particular pasture, owing to the variety of sustenance being considerable, yet proportional harm will ensue sufficient to induce us not to repeat the risk. Nature, the best of guides in all that relates to the protection of her creatures, is no where more pointed in her directions than on this head. A necessity for a variety of food, and a desire to secure it, are implanted in the disposition of every animal ; and where is the creature more prone to extensive rambles than the sheep ? We limit it to a paltry pasture-ground of roods and acres, but does it not show, by its determination to transgress our barriers, that such is not the *treatment* nature has designed for it ? There is some-

thing more than wildness of character, and restless disposition, in the powerful attempts it continually makes to defy our artificial boundaries. There is in these efforts a longing for fresh fields and other herbage, an instinctive feeling that all is not as it ought to be ; and yet we attend not to the hint ! Nothing will conduce so much to the health of the sheep, and to the speedy taking on of fat, as the frequent shifting of the flock. Disease will doubtless still affect the animals, but illness will be rare, and mortality diminished, if by the care of their rulers, they are enabled to obtain what instinct tells them is the best of medicine.

(85.) *Varieties induced by apparently trivial causes.*—Surrounded in a civilized state, by all that can minister to the supply of wants, whether real or supposed, man is not on that account to be imagined as always so situated. Look to savage nations, and remark their destitute condition, their dependence on the uncertain proceeds of the chase, and their reliance on modes of agriculture as unprofitable as they are unmatured. Countries there are certainly to be found, where the “elements of temperature,” are so fortunately balanced and combined as to produce only good effects, and in which the rude inhabitants reap the fruits of a spontaneous plenty ; but these form only a small proportion of the globe, and in most regions man must give his unceasing endeavours to the cultivation of a plant or animal, before he can raise it from the miniature condition in which he finds it, to such a size and richness as will satisfy his wants. Nor need we go far for illustrations. The crab has been transformed into the apple, and the sloe into the plum. None of our cereal

grasses, as now cultivated, are to be met with in a wild state ; they have evidently been brought to their present fulness by the care of ages. The red cabbage and the cauliflower are the altered descendants of a widely different sea-side plant. The different races of cabbages are examples of a wonderful deviation from the natural type, and they all require much nicety in cultivation to prevent them assuming the characters of the original stock, as, when permitted to grow wild, especially on a sterile soil as that of the sea coast, they are sure in no long time to become exact counterparts of their originals. Cultivation, also, though taken in rather a different sense, influences to a great extent the form and features of animals. In proof of this may be adduced the differences that exist between different ranks of inhabitants in almost all countries. Buffon says, that in France you may distinguish by their aspect not only the nobles from the peasantry, but the superior orders of nobility from the inferior—these from citizens, and citizens from peasants. The African field-slaves in America, are extremely different from the domestic servants of the former nation, retaining as they do their original peculiarities from poor living and degrading duties ; while the latter have nearly approached to the habits and modes of thinking of their masters, from living with them, and being well treated under the same roof. “ The South Sea islanders,” says Dr Elliotson, “ who appear to be all of one family, vary according to their degree of cultivation. The New Zealanders, for example, are savages, and chiefly black ; the New Hollanders half civilized, and chiefly tawny ; the Friendly

islanders are more advanced, and not quite so dark ; several are lighter than olive colour, and hundreds of European faces are found among them." Indeed the examples are almost endless which I could bring forward to aid my explanations ; but these it would be needless to give, since it is in the power of every one to study the differences in form and features of the classes of society in our own island, and by so doing understand the influence of otherwise trivial and unimportant circumstances, on an animal at all times so easily moulded to situation as the sheep.

(86.) *Varieties from mode of Breeding*.—Changes are wrought for the most part by attention to the mode of propagation of the plant or animal, by the plan of crossing ; and by careful selection of the parent stock. Every one must be struck with the varieties constantly occurring in the vegetable world : Flowers change their colours, and become double ; and these characters can be perpetuated by seed. Hedge-row plants may be observed to vary even in the limits of an ordinary walk, and to be continued as varieties so long as they remain in the same locality. The following striking example of the extent to which plants may be made to vary by altering their circumstances, is related by Mr Herbert in the *Horticultural Transactions*, vol. iv :—" I raised from the natural seed of an umbel of a highly manured red cowslip, a primrose, a cowslip, oxlips of the usual and other colours, a black polyanthus, a hose-in-hose cowslip, and a natural primrose bearing its flower on a polyanthus stalk. From the seed of that very hose-in-hose cowslip, I have since raised a hose-in-hose primrose. I therefore consider all these

to be only local varieties, depending upon soil and situation." "Fifty years ago," says Buffon (writing in 1749), "our pot-herbs consisted of a single species of succory, and two of lettuce, both very bad ; but we have now more than fifty kinds of lettuce and succory, all of which are good. Our best fruits and nuts, which are so different from those formerly cultivated that they have no resemblance but in the name, must likewise be referred to a very modern date. In general, substances remain, and names change with times : but in this case names remain, and substances are changed. Our peaches, our apricots, our pears, are new productions with ancient names. To remove every doubt upon this subject, we have only to compare our flowers and fruits with the descriptions, or rather notices of them transmitted to us by the Greeks and Romans. All their flowers were single, and all their fruit-trees were wild stocks, and their species very ill-chosen. Their fruits of course, were small, dry, sour, and had neither the flavour nor the beauty of ours. These new and good species originally sprung from the wild kinds ; but how many times have their seeds been sown before this happy effect was produced ? It was only by sowing and rearing an infinite number of vegetables of the same species, that some individuals were recognized to bear better and more succulent fruit than others ; and this first discovery, which supposes much care and observation, would have remained for ever useless if a second had not been made, which implies an equal degree of genius as the first required of patience—I mean the *mode of multiplying* by engrafting those precious

individuals which unfortunately cannot propagate or transmit their excellent qualities to their posterity. * * * In the animal kingdom, most of those qualities which appear to be individual are propagated and transmitted in the same manner as their specific qualities. It was therefore more easy for man to have influence upon the nature of animals than upon that of vegetables. Particular races in any species of animals, are only constant varieties, which are perpetuated by generation. But in the vegetable kingdom there are no races, no varieties so constant as to be perpetuated by reproduction. In the species of the hen and pigeon, a great number of races have been very lately produced, all of which propagate their kinds. In other species, we daily rear and improve races by crossing the breeds."

(87.) *Breeding in-and-in*.—Though there are several methods pursued by breeders for the improvement of flocks, the one most in vogue is, that of choosing individuals of the same family, and breeding *in-and-in*. It is however a plan requiring, for the safety of the flock, either very great skill in selecting the males and females, or only to be followed to a very limited extent. No subject ever called forth so much random controversy, and no evil has ever so clearly shown itself as such; yet it is only recently, that people have opened the intellectual eye to the dangers of a practice, against which the ablest pens were long and vainly blunted. The object of breeding *in-and-in* is to strengthen good qualities and get rid of bad ones, as speedily as possible; and it is plain, that if we happen to select animals with slight imperfections, these imperfections will become

hereditary, and will go on assuming a worse and worse type till the breed be destroyed. Culley, however, was of opinion, that less risk is run by breeding *in-and-in* than is generally supposed, and instances the wild cattle in Chillingham Park, in the county of Northumberland, which, having been confined for several hundred years without intermixture, must have bred from the nearest affinities, and yet are just as they were five hundred years since. With all due deference, however, to the opinion of the late Mr Culley, I must assert, that I cannot perceive in what manner wild cattle can be made to illustrate the case in point, as it must be evident, that animals in a state of nature differ essentially from those in charge of man, in regard to the propagation of infirmities, as the former, if born with a radical defect, will, ten to one, never see the age which suits them for reproduction ; while the latter, from the care bestowed upon them, will, even when very delicate, in many instances be bolstered up till they have entailed upon posterity an accumulation of their already aggravated maladies. The system of breeding *in-and-in* proves, in fact, as destructive to flocks, as marriages of near relations to the human kind. We would not witness an every-day entailment of diseases, if people would forego their unnatural love of money, and cease their endeavours to keep it in "the family," by forming matrimonial alliances with those who are near of kin. The law of God forbids us to wed those who stand in certain degrees of propinquity ; but, if we and our descendants avail ourselves of the limits of this law, and marry on its verge a certain number of times, misery must infallibly *be the lot even of the tenth generation ; and instead of*

being fathers of a mighty people, few and full of sorrow will be the days of our children ; while in place of retaining in their possession our darling wealth, it will, ere long, pass into the hand of the stranger.

(88.) *Opponents of in-and-in breeding.*—Different individuals at various times, and in widely separate places, have by their observations rendered the criminal absurdity of this system perfectly apparent to all, who, unbiased by party principle, are anxious for a knowledge of the truth. A few of these I shall mention. Ezra L'Hommedieu, Vice-president of the Agricultural Society of New York, collected, in the year 1800, a great many observations on the breeding of sheep, and came to the conclusion, that changing and crossing the breed of the animals is a matter of great importance, in preventing a dwindling and degeneracy of the flock. Dr Coventry, in his pamphlet on *Live-Stock*, gives it as his opinion, that “ The most perfect race of animals may be debased by improper mixture, or injured by improper treatment. Indiscriminate matches in breeding, and inattentive management in rearing, are alike capable of producing a worthless progeny.” Here the matter is made very plain, from comparing an evil, the progress of which is insidious, with the injurious consequences, which the most unobserving can easily trace to a parallel neglect. Mr Dick of Edinburgh, so well known for the valuable and trustworthy information he has accumulated, has been informed by eminent farmers, “ that cattle bred *in-and-in*, are very subject to *clyers* in the throat after they have attained their first year.” By *clyers* are meant enlarged lymphatic glands, which are a sure sign of

what is termed a scrofulous habit, a breaking up of the constitution, which, though produced by a variety of causes, is yet frequently the result of an "*our sib*" connection. These are, I may say, the accidental opinions of men who had no point to make good, in which their credit was at all at stake, and who are not endeavouring to support the crude opinions of former years. For these reasons, they possess a value which ought to give them a proportional weight in an investigation like the present. Mr Bakewell succeeded in bringing his sheep to great perfection as regards form, and rapidity of fattening, by breeding in the same family for a great many years ; but it was attended with considerable deterioration in the quality of the wool, and engendered a liability to disease, sufficient to deter any one from proceeding a similar length in the same track, to what is so dubiously called improvement. See what Mr Dickson says to this effect, in a recent number of the *Quarterly Journal of Agriculture*. "The evil of breeding *in-and-in*, or in other words, producing too great refinement of tone, is manifested in the first instance by a tenderness of constitution ; the animals not being able to withstand the extremes of heat and cold, rain and drought. If the evil is prolonged through several generations, the forms of the animals become affected, the bone becomes very small, the neck droops, the skin of the head becomes tight and scantily covered with hair, the expression of the eye indicates extreme sensibility, the hair on the body becomes thin and short, and the skin as thin as paper ; the *points* continue good, and predisposition to fatness increases, *but the whole carcass* becomes much diminished in

size, though retaining its plumpness, and beautiful symmetry. The evil, however, does not terminate in the production of these symptoms. Internal diseases ensue, such as disorganization of the liver, or rot, polypi in the trachea, clyers, malformation of the bones of the neck and legs, and general deformity." This position, however, will be strengthened by drawing attention to insulated portions of our race, where the effects of such a system are exhibited on a considerable scale. The Members of the Society of Friends were, at one time, supposed to be of all others the least subject to insanity; but the very reverse is the case; being, from the limited nature of their sect, driven to frequent intermarriages, and to a consequent deterioration of the most active part of the human frame—the brain. It is for the same reason, that almost every royal family contains a large proportion of idiots, or, at the best, persons of very weak intellect; and, such will continue to occur, till legislators fall on some plan of striking at the groundwork of the mischief. If the laws of God and man define to us so clearly the evils of intermarrying with relatives; and if, as all animals are constructed on one grand plan, we admit the proximity of the sheep to the human race, it follows, that what is destructive, in this respect, to the one, is destructive to the other; and that we should seek, by a nearly similar, if not wider, range of rules, to obviate many of those diseases of which, when under our protection, they are so frequently the subjects.

(89.) *Breeding from different families of the same race.*—Mr Culley, though believing that no great harm

can result from breeding in-and-in, yet appears to have in a manner preferred the preferable practice of breeding from different families of the same race ; as he, for many years, hired his rams from Mr Bakewell, at a time when other breeders were paying a liberal price for his own valuable animals. This is of all methods deservedly the best, as the males, which are interchanged, have always had shades of difference impressed upon them, by various soils and treatment, so that the defects of each family have a good chance to be counteracted by the perfections of the other. By this means the bad points are gradually exhausted, and their valuable properties as gradually heightened. Breeders have been much aided in the furtherance of this desirable plan, by the rearing of superior rams having become, of late years, a separate pursuit. The letting of them out to distant parts of the country has long been a branch of this speculation ; diffusing some of the most valuable points of particular breeds, and leading to a spirit of competition. The practice has been reprobated, but, I presume, rather hastily ; for with all its attendant evils, such as leading to deception, by what is termed the *making up* of rams, it possesses excellencies which will, I hope, lead to its continuance.

(90.) *Crossing*.—The only other method of improving a breed is by crossing two distinct races, one of which possesses the properties it is desirable to acquire, and wants the defects we wish to remove. This, however, is a measure not to be recommended, and only to be resorted to when neither of the others will do ; for *it is scarcely possible to obtain the desirable properties without at the same time imparting qualities sufficient*

to neutralize them ; and with which, in fact, we would rather dispense. To cross, as Mr Cleghorn remarks, any mountain breed with Leicester rams, with a view to obtain a propensity to fatten at an early age, would be attended with an enlargement of size, which the mountain pasture could not support, and the progeny would be a mongrel race, not suited to the pastures of either of the parent breeds. The folly of such a proceeding is beautifully shown in the failure of the attempts made, some years ago, to better the fleece of the mountain sheep, in the South of Scotland. To effect this desirable end, rams were brought from the Cheviot range of hills, and the consequences were, as described by Mr William Hogg, of Stobbo, in the *Quarterly Journal of Agriculture*, just what a preliminary consideration of the existing circumstances would have proved to be unavoidable. " The independent habits of the mountain flocks were lost, and a mongrel progeny, of a clumsy figure, occupied the lowest and warmest of the pastures. As they were very improper subjects to breed from, they were often a drug in the market : *but the store-master had no other resource, but to struggle on against the opposition which the animal itself made to the change*, and, also, against the influence of bad seasons, in order to get the influence of the Cheviot breed fully established. * * * With its shaggy coat the animal lost its bold independent look, its stout shape, its unvitiated taste, and its sound constitution. A course of severe winters too occurred during the time of changing, while every property calculated to resist privation and fatigue was unconfirmed in the progeny ; and, in consequence, the ravages by rot, and poverty,

among the flocks that occupied soft pastures were immense." How did it happen, that the store-master had no other resource but to persevere in an unprofitable course? Was he obliged to strive against natural obstacles, which even a short experience might have taught him were, in that manner, insurmountable? Why not recur *at once* to the old mode of management, rather than injure himself by kicking against the pricks. "Sundry store-masters were not aware," says Mr Hogg, "that their old breed would so obstinately resist the impression of the Cheviot blood, nor did they ever dream that the mongrel issue would be so easily subdued by the hardships and cold of winter : thus finding their scheme opposed, at points where they anticipated little resistance, they gave up the experiment ere it was *half completed*, and introduced mountain rams to the mongrel issue." Enough, however, has been said to prove that this plan ought not to be pursued : let me now say a few words as to the reasons which should deter us from its adoption. To take a familiar illustration :—How would one of the worshipful company of Aldermen, or a dignitary of the Church, manage to keep up an *appearance*, if suddenly transported from the luxurious plenty which surrounds him, to the meagre fare, and churlish climate, of our Highlands? Would their offspring, which ten to one would be prone to rapid growth, and, therefore, requiring at the least a large supply of porridge and milk ; would they, I ask, arrive at a healthy maturity, if supported only on the oaten cake, and *whang* of skimmed-milk cheese, of the hardy Northern? The answer is, they would not. They *would*, doubtless, bear the climate ; but the habit of

body imprinted on them, by the full living of the parents, would require a more nutritious food to bring it to the adult age, than what might be necessary for the sustenance of any child descended from the possessors of the soil. If such then is the case with the young of an animal shielded from inclemency on every hand, how can we expect the progeny of a rather heavy variety of a defenceless creature like the sheep to thrive, in defiance of every thing ungenial, on a pasture which requires for its collection, in any quantity, a degree of experience and activity, the result of time and well-trained instinct. The mongrel is not unfitted for the locality, as Mr Hogg would have it, by a weakness resulting from "the constant and continued exertions of the two bloods, the one endeavouring to overpower the other," there is no war waging in the progeny between the blood of sire and dam; the secret lies in the animal being unsuited for the pasture where it is produced. Place it in a country possessing a herbage something between that of the Highland and Cheviot hills, and it will do passing well; but do not ascribe the want of success to a natural hatred of the breeds. Again, do not fall into the error, that "the figure, wool, and other qualities, of the Cheviot ram, are most conspicuous (in this cross) in the smallest and feeblest of the progeny, while the properties of the mountain breed are more fully exhibited in the strongest and most robust lambs," a circumstance which, unfortunately, induced many of the store-farmers "to throw aside the best of the lambs, and select those to breed from, which had apparently most of the Cheviot figure;" or, in other words, do not suppose, as Mr Hogg strangely enough infers, that only the weak animals

took on the Cheviot form, and only the strong ones assumed the Highland character. The correct explanation is, that such as had most Cheviot blood were sure to become puny, from being unadapted to a herbage on which those that resembled the mountain stock thrived tolerably well. Strength and feebleness were, in this instance, mere secondary matters.

(91.) *Things to be attended to in Crossing.*—The fact is, that, if you wish to have a *particular kind* of sheep, you must first of all be in possession of a pasture suitable for the new comers. You must consider the influence of the individual parents on the progeny, the size of the animals, their habits and dispositions, and their peculiarities in regard to the time of their maturity, and fattening properties; and, having anticipated these apparently trifling affairs, you must see that the surface of your farm, its degree of exposure, and the quantity and quality of its productions, are calculated for the profitable maintenance of the animal in view. Far too little attention is bestowed, at the commencement of such an undertaking, on these all-swaying matters. Farmers enter upon this, the most arduous of all professions, with the settled conviction, that nothing is so simple as the engrafting of a race of animals on a particular part of a country. They have read, or heard, of others who have gained fame, and a fortune, by successful endeavours of the kind, and they think that nothing is easier than to follow their example; but they forget the thoughtful hours, and irksome duties, these men had to tolerate, before they could speak of any thing *like success*. No animal can be made to forego at once *a long used food*, an ancient locality, peculiarity of

clime and season, and the instinctive habits that have been long nurtured by these, without both it and its progeny suffering from the change :—Nature cannot thus be made to bend to human intention ; it will give way in the attempt.

In crossing there are several important things to be attended to. Well formed parents ought to be selected, and, if enlargement of the carcass be wanted, the issue should be better fed than its originators, which ought to be of a size rather under, than above what the pasture is capable of supporting. The size of the parents should not be much disproportioned at first, as nature abhors sudden extremes, and does every thing in the most gradual manner. It is better, when some increase has been attained, to bring the breed to the required size by one or two crossings.* In choosing a breed, we should adopt that which affords the greatest quantity of market produce, in return for the food consumed ;† and a particular breed ought always to be preferred to the sheep of a district. We must not

* Dr Cline, in a communication to the Board of Agriculture, observes on this point : “ Experience has proved, that crossing has only succeeded in an eminent degree, in those instances in which the females were larger, than in the usual proportion of females to males, and that it has generally failed when the males were proportionally large.”

† It was owing to a peculiar view taken of this maxim, that so enormous sums were asked and given, for the hire of rams, at the time Mr Bakewell brought the new Leicester to perfection. That gentleman would never have obtained 1200 guineas for the hire of three rams if the speculators had not intended to procure nearly similar prices for the use of the offspring of these animals ; and it may be pretty safely affirmed, that this traffic was ultimately the cause of much mischief to the breed in question, by inducing many to speculate on what was likely to prove a fashionable article, without caring much for the endurance of the really valuable points.

imagine, that when, by dint of crossing, we have obtained the variety wanted, that it will remain in the condition to which we have brought it, without the slightest liability to alter. Many farmers believe they have done all that is required, if they subject their stock to three or four crossings with a breed of acknowledged excellence. They think that the improved animals they have obtained will support their acquired characters, uninfluenced by extraneous agency. Now nothing can be more faulty than this mode of management, as is proved by a comparison of stock so treated, with flocks which have uninterruptedly received that undeviating attention, which can alone ensure a continuance of the properties desired. Such men forget, that the climate is operating with as great certainty on the animals as on the rocks around ; and that as the herbage is determined by the nature of the adjacent rocks, so are the peculiarities of the sheep influenced by the herbage ; and that if they manage to change the characters of the breed, it can, in a majority of cases, be only for a time, unless the tendencies of the surrounding elements are counteracted, by a constant recurrence to the originators of the flock. "I am sorry," says Little, in his valuable practical observations, "to say, that there are too many examples of those, who thought themselves at the head of improvement in stock, relaxing their exertions, and keeping by their own stock ; and the consequence has been, that such stocks have degenerated, become delicate, tender, and diminutive in size ; and from no other cause but that the same pains have not been taken to preserve *the improvement*, that was taken to effect it. I could

mention many improvers who were of the first class formerly, but who are now only in the second." Changes, in fact, by crossing are not to be effected in a short space of time ; you must look forward to several years of constant exertion, before you can hope, in this manner, to alter your stock.* Then, again, we must be aware of the tendency which nature, in numerous instances, displays to perpetuate diseases, dispositions, and aberrations from the normal structure. Many qualities and diseases, are known, in man, to be hereditary ; of the former, I may instance peculiarities in walking, and writing ; a passion for intoxicating liquors, and other habits too trivial to mention ; and of the latter, gout, pulmonary consumption, and blindness from cataract, which are well known to harass a family for generations. Features, in like manner, may remain for ages of the same undeviating cast ; thus the Jews of to-day are the very counterparts of the Jews of three thousand years back, and, in all likelihood, will so remain till the end of time. A predisposition to many diseases is engendered in the sheep, by too great a refinement in breeding, which tends to diminish the size of the animal, prevents them feeding to perfection, destroys their fecundity, and imparts great tenderness of constitution. Accidental deviations from the natural type may, also, be hereditary, as is seen in those races of dogs which have a supernumerary toe on the hind foot, and tarsal bones to correspond. In the human race also several generations of a particular family

* Dr Sturm, professor of Agriculture, at Bonn, says, that a new race may be produced in the same number of years as are required for perfecting the teeth.

have been distinguished, by having six fingers and six toes, on their hands and feet. It is in like manner to an accidental malformation, that the Americans are indebted for their Otter breed of sheep. Mr Livingston, who wrote in 1811, thus describes them: "The Otter sheep were first discovered on some island, on the eastern coast, and have spread to the adjoining states. The sheep are long-bodied rather than large, and weigh about 15 lbs. a quarter. Their wool is of a medium fineness, and a medium length; but that which particularly characterizes these sheep is the length of their bodies, and the shortness of their legs, which are, also, turned out in such a manner as to appear rickety. They cannot run, or jump, and they even walk with some difficulty. They appear as if their legs had been broken and set by some awkward surgeon. They can scarcely exist in a deep country, and they cannot possibly be driven to a distant pasture or market." Dr Dwight, in his travels in New England, remarks of this curious variety, that the fore legs are remarkably short, and bent inward, "so as distinctly to resemble what are called club-feet."* I believe this to be the only instance where man has availed himself of a defect in the animal kingdom, and turned it to his advantage. Attention ought also to be bestowed on the order in which different parts of the animal are subjected to changes during crossing. These, according to Dr Sturm, the latest observer on this head, are first exhibited in those parts that possess a power of being reproduced, as the hair,

* Sheep are as liable to distortions of the skeleton as other animals. The Museum of Guy's Hospital contains a very good specimen of distorted spine taken from a sheep.

horns, and hoofs. The fleshy parts change slowly, in proportion as the mother has much of the blood of the original race. The first changes take place in the head, and are gradually developed towards the hind quarters. Lastly, look to the condition in which your sheep are as regards fatness. If fat, they will be averse to becoming pregnant, and considerable annoyance will, in all likelihood, be experienced. A moderately low diet is most suitable for ewes, for some time before the ram is admitted, in the same way that fruit trees, when unproductive in a rich soil, are rendered fertile by placing straw and stones between their roots and the too nutritious earth. A rather poor diet, also, during pregnancy, will be found to obviate many of those risks which are sure to be incurred from repletion during this period.

(92.) *Choice of Parents.*—However faulty sheep may be, some are always to be found surpassing their fellows, and these it ought to be the aim of every breeder to discover. Without a knowledge of an animal's *points*, it is in vain that the breeder can hope for improvement. He may by accident make a lucky hit, but, unless he has studied his business from the bottom, he cannot follow up and avail himself of an advantage, which a more knowing individual would, from previous training, turn at once to a profitable account. Much may be done by letter-press description; and this I shall endeavour to achieve; but more will be accomplished by a close and attentive examination of a few well-selected animals, which it is now no difficult matter to get a view of, as, thanks to the spirited exertions of the Highland Society, valuable specimens are far

from rare. In breeding and rearing rams, two divisions of these animals are recognised,—ram getters, and wedder getters,—the former, from their fineness, being kept for the procreation of animals like themselves, while the latter, from their coarseness, are set aside as fitted only for parent stock for grazier's sheep, the mere grazier liking a ram no worse for having a massy frame, and being less scrupulous about his form than the ram breeder, whose grand object is fineness, and who trusts to the ewes for giving the offspring size and substance. The principal ram-breeders are guided in the choice of their ram-lambs, more by blood or parentage, than by form, on which, at so early an age, little dependance can be placed. In the case of the Dishleys, they allow them every indulgence, from the time of weaning till that of shearing, as they push them forward with the intent of letting them the first season, while yet yearlings. It is this early arrival at maturity, which is, with truth, supposed by some to occasion their early falling off; for by a law of the animal economy, premature adult age is always succeeded by premature decay; life appearing to be dated from the time the animal enters on the fulfilment of the ends for which it was created.

According to Mr Bakewell, the shape which should be the criterion of a sheep, is that of a hogshhead or firkin, truly circular, with small and as short legs as possible: upon the plain principle, that the value lies in the barrel, not in the legs; and all breeds the backs of which rise in the least ridge are bad. Their bodies should be as true barrels as can be seen, their backs *round and broad*, and their legs not much exceeding

six inches in length. The following is a measurement of a three-years' old ram of Mr Bakewell,

	Feet.	Inches.
Girth,	5	10
Height,	2	5
Breadth of Collar,	1	4
Breadth of shoulders,	1	11½
Breadth across the ribs,	1	10½
Breadth across the hips,	1	9½

A most unusual proof of kindly feeding in the animals of this shape, is their feeling quite fat, just within their fore legs, on the rib ; a point in which sheep are seldom examined, from common breeds never carrying fat there. They are particularly distinguished by the lightness of the offal, the bones being one-half smaller than in some other breeds, and the meat proportionally thicker, while the pelt is thin, and the head small—a thing of some consequence in most parts of England, where that Scottish luxury, sheep-head broth, is so cordially despised.

The best form for a cheviot ram is thus described by Mr Cully, in his excellent work on *Live-Stock*: “ His head should be fine and small ; his nostrils wide and expanded ; his eyes prominent, and rather bold or daring ; ears thin ; his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down ; the shoulders broad and full, which must at the same time join so easy to the collar forward and chine backward, as to leave not the least hollow in either place ; the mutton upon his arm or fore-thigh must come quite to the knee ; his legs upright, with a

clean fine bone, being equally clear from superfluous skin and coarse hairy wool from the knee and hough downwards ; the breast broad and well forward, which will keep his forelegs at a proper wideness ; his girth or chest full and deep, and instead of a hollow behind the shoulders, that part by some called the fore-flank, should be quite full ; the back and loins broad, flat, and straight, from which the ribs must rise in a fine circular arch ; his belly straight ; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out ; his twist deep, wide and full, which, with the broad breast, will keep his four legs open and upright ; the whole body covered with a thin pelt, and that with bright soft wool. The nearer any breed comes up to the above description, the nearer they approach towards excellence of form." As an amusing contrast to this well drawn picture, I give an extract from the work of that ancient agriculturist Columella.

" Therefore, the way to judge and approve of a ram, is not only that of observing if he is clothed with a white fleece, but also if his palate and tongue are of the same colour with his wool ; for when these parts of his body are black or spotted, there arises a black or speckled offspring. And this, among other things, the same poet I mentioned above, (Virgil, Georg. Lib. iii.) has excellently pointed out in such numbers as these :"

" Reject him, tho' the ram himself be white,
Under whose ousy palate lies concealed
A black or spotted tongue ; for with black spots
He'll stain the fleeces of his future race."

After some amusing remarks on the same subject, de-

livered in a very quaint way, he concludes his description with the mention of "twisted horns,"—"not because this last is more useful, (for a ram without horns is better,) but because horns that are twisted and bended inwards are not at all so hurtful as those that are set upright and expanded. Nevertheless, in some countries where the climate is wet and windy, we would wish for he-goats and rams even with the very largest horns; because, when they are high and extended, they defend the greatest part of the head from the storm."

It is thus that among some of his most beautiful remarks, we have generally a something occurring which upsets the gravity of the whole by its childish absurdity.

(93.) *Influence of Sex.*—In early ages, the greater share of attention appears to have been bestowed on *male* domesticated animals, on account of the more numerous offspring of which they would become the parents; and from this, as the Rev. Henry Berry, of Acton Beauchamp, Worcestershire, supposes, (in a valuable essay on the breeding of live stock, published in the *British Farmer's Magazine*,) has originated the prevalent idea, that the male has a more decided influence, than the female, on the form of the progeny. "The ideas entertained respecting the useful qualities of an animal would (in former times) be very similar, and lead to the adoption of a general standard of excellence, towards which it would be required that each male should approximate; and thus there would exist, among what may be termed fashionable sires, a corresponding form and character, different from, and superior to, those of the general stock of the country. This form and character would, in most instances, have been

acquired by *perseverance in breeding from animals which possessed the important or fancied requisites*, and might, therefore, be said to be almost *confirmed* in such individuals. Under these circumstances, striking results would doubtless follow the introduction of these sires to a common stock ; results which would lead superficial observers to remark, that individual sires possessed properties as *males*, which, in fact, were only assignable to them as *improved* animals."

In general, the qualities of the male and female parents are visible to an equal extent in the offspring, as is well exemplified among horses, in the mixture of the blood and cart breed, where the great difference in form and character is nicely blended ; but, occasionally, the peculiarities of the male, or female, are visible only on some particular part of the offspring, as in the crossing of the Merino ram with the Ryeland ewe, when the former affects the fleece, and the latter the carcass.

Though there are many opinions as to the comparative influence of the sexes on the progeny, yet, as before stated, the majority of voices represent the male as the more influential. Mr Boswell, in his essay on this subject, published in the *Quarterly Journal of Agriculture*, and in the *Farmer's Magazine*, is decidedly of this opinion, " Being fully convinced of the power of the male on the offspring, I have always accounted it as a loss to put a bad male to a high bred female, and have never done so. I have, however, observed, where the country people have purchased high bred sheep at any sale of mine, and bred from them with *the ordinary rams*, that the breed very quickly got

bad ; whereas, when a Bakewell ram had been purchased, I have seen a most remarkable change on the quality of the sheep ; and, in several instances, where the ewes (Highlanders) had been tolerable from which they had bred, the cross was so nearly resembling a new Leicester, as to deceive any one who was not a thorough judge." Bewick, the natural historian, supports this opinion when speaking of the original breed of wild cattle, still to be found in a few English and Scottish parks. They are uniformly pure white, with black or red ears and noses. He says, that cows, when in season, used often to be turned into the park at Chillingham Castle, in Northumberland, and that, when covered by the wild bull, *all their produce was uniformly white, with red ears and noses*. On the other hand, the female is, also, prevalently believed to have some share in the matter, and much may be adduced as evidence of its power over the form of the offspring, equally authentic with the former. Mr Ferguson, in a paper on live-stock, in the *Quarterly Journal of Agriculture*, relates the following apposite and amusing story :—

" Naturalists are, I believe, nearly agreed, that the influence of the male exceeds that of the female in communicating qualities to the offspring, and a very providential arrangement it is, in respect that good points may be thus diffused with far more rapidity than could otherwise occur. The choice of the female is by no means, however, a matter of indifference, and it is only by due attention to both that perfection can be looked for. I recollect several years ago, at a distinguished breeder's in Northumberland, meeting with a shrewd

Scottish borderer, (indeed, if report be true, the original and identical Dandy Dinmont,) who, after admiring, with a considerable *spice of national pique*, a very fine short-horn bull, demanded anxiously to see the dam. The cow having been accordingly produced, and having undergone a regular survey, Dandy vociferated, with characteristic *pith*, '*I think naething o' your bull now, wi' sic a caumb ;*' and, unquestionably, the mould or '*caumb*' must have its own share in producing shapes, though in his haste to detract, (as he thought,) from the merits of the bull, poor Dandy totally overlooked the additional compliment paid to the judgment of the '*Southron*.'"

It is in general supposed, that if the female be by descent small, that the length of the legs of the issue will not be influenced by the male. The weight of the carcass is a good deal affected by the male, but not so much as by the female. The impressions of one or other, especially of the male, do not cease on the birth of the fruits of a connection, for though he may have no further meeting with that female, yet are the succeeding offspring tinged with his peculiar colour, or modelled after his form. This is well illustrated by a fact which came under the notice of the Earl of Morton. His lordship bred from a male quagga and a mare of seven-eighths Arabian blood, a female hybrid, displaying in form and colour her mixed origin. The mare was then given to Sir Gore Ouseley, who bred from her first a filly and afterwards a colt, by a fine black Arabian horse, but both these, in their *colour and in the hair of their manes*, strongly resembled the quagga. This isolated fact would be, however,

but of small value if unsupported by others, which are luckily now of common occurrence, among which the following tends strongly to its corroboration :—In the *Philosophical Transactions* for 1821, Dr Wollaston relates that D. Giles, Esq., had a sow of the black and white kind, which, after littering by a chestnut boar of the wild breed, was put, some time after the death of this, to boars of quite a different variety, yet the offspring were covered with chestnut marks, so as closely to resemble the long-departed animal.

The progeny of most domesticated animals often bear a striking resemblance to the grandmother or grandfather, and it is well known that the desired changes cannot be effected on a breed, or that the desired breed cannot be produced, till the third, fourth, or even the fifth crossing, so that the importance of having few defects in a stock will be readily admitted, seeing their debasing consequences are carried through whole generations, and that though absent in one remove, yet that they may appear in the next. Both sire and dam should be chosen as free from defects as possible, a thing often neglected in rearing domestic animals, especially horses, where the opinion is in vogue, that no matter how debilitated and worn out may be the dam, yet that if coupled with a young and perfect sire, a healthy handsome offspring will be the issue ; than which idea nothing can be more absurd, as such animals, if left to nature, would seldom or never come in contact, owing to the one party never attaining a decrepit age, but perishing on its verge.

(94.) *The sex of the progeny is supposed to be the result of the relative ages of the parents ; thus, issue*

from a young male and an old female will in general be feminine, while that from an old male and a young female will generally be masculine ; and it has been proposed to turn this, apparently a law of nature, to account, in the management of flocks, as it must often be of consequence to obtain, at will, a considerable increase of the sex most wanted. On this subject there will be found an interesting paper in the first number of the *Quarterly Journal of Agriculture*, entitled, "A method of obtaining a greater number of One Sex at the option of the Proprietor, in the Breeding of Live-Stock," and from this I extract the following :—

"In the *Annales de l'Agriculture Française*, Vols. xxxvii. and xxxviii., some very interesting experiments are recorded, which have lately been made in France, on the breeding of live-stock. M. Charles Girou de Buzareingues proposed, at a meeting of the Agricultural Society of Séverac, on the 3d of July, 1826, to divide a flock of sheep into two equal parts, so that a greater number of males or females, at the choice of the proprietor, should be produced from each of them. Two of the members of the society offered their flocks to become the subjects, of his experiments, and the results have now been communicated, which are in accordance with the author's expectations.

"The first experiment was conducted in the following manner :—He recommended very young rams to be put to the flock of ewes from which the proprietor wished the greater number of females in their offspring ; and also, that during the season when the rams were with the ewes, they should have more abundant pasture *than the other* ; while to the flock from which the pro-

prietor wished to obtain male lambs chiefly, he recommended him to put strong and vigorous rams, four or five years old. The following tabular view contains the result of his experiment :—

Flock for female lambs.			Flock for male lambs.		
Age of the mothers.	Sex of the Lambs.		Age of the mothers.	Sex of the Lambs.	
	Males.	Fem.		Males.	Fem.
Two years, . . .	14	28	Two years, . . .	7	3
Three years, . .	16	29	Three years, . .	15	14
Four years, . .	5	21	Four years, . .	33	14
Total, . . .	35	76	Total, . . .	55	31
Five years and older,	18	8	Five years and older,	25	24
Total, . . .	53	84	Total, . . .	80	55
N.B.—There were three twin-births in this flock. Two rams served it; one fifteen months, the other nearly two years old.			N.B.—There were no twin-births in this flock. Two strong rams, one four, the other five years old, served it.		

“ The general law, as far as we are able to detect it, seems to be, that when animals are in good condition, plentifully supplied with food, and kept from breeding as fast as they might do, they are most likely to produce females. Or, in other words, when a race of animals is in circumstances favourable for its increase, Nature produces the greatest number of that sex which, in animals that do not pair, is most efficient for increasing the number of the race. But if they are in a bad climate, or on a stinted pasture, or if they have already given birth to a numerous offspring, then Nature, setting limits to the increase of the race, produces more males than females. Yet, perhaps, it may be premature to attempt to deduce any law from experiments which

have not yet been sufficiently extended. I have disposed to ascribe much of the effect to the ram, independent of the condition of the

CHAPTER V.

MANAGEMENT OF SHEEP.

(95.) Those who have attended to the subject are well aware, that the profitable management of stock is the most difficult department in the management of a farm. So much depends on the nature of the soil where sheep are kept, and on its situation in relation to markets for the disposal of its produce, that what is of general application need be written with a heavy head. Precise rules for agricultural conduct can never be laid down with any probability of their being followed, as it must necessarily vary less or more according to the peculiar circumstances of the estate, and must therefore, to a great extent, be trusted to the judgment and sagacity of the farmer. All, therefore, that I have to say at in treating of this division, will be the giving a general line of the more important matters connected with sheep-husbandry, leaving the tyro to use it as his own circumstances may point out. For obvious reasons the present arrangement of the subject is the best; and as I have therefore, I shall, as much as possible, adhere to it.

(96.) *Putting Tupes to Ewes.* The middle of November is the time at which this is usually done, *the season is anticipated or delayed according to the season.*

spring provender is expected to be early or late, plentiful or scarce. When the sheep are spread over a wide track, one ram is in general allotted to thirty ewes ; but when the latter are on a limited range of pasture, the proportion of one to fifty may be reckoned ample. The rams ought not to be left with the ewes above four or five weeks, as it does not do to have lambs dropped after the middle of May ; indeed much trouble will be saved to the shepherd if he can contrive to have all the lambs yeaned about the same time, as the flock will, from its numbers being of a similar standing, be healthier, and every way easier to manage, than one in which there is a great diversity of ages. Such ewes, therefore, as have not evinced an inclination for the male, ought, before the above period has elapsed, to be driven into a barn or small inclosure, and made to run about till they have become a little heated, after which, when the ram is introduced, the desired effect will doubtless follow. Delay will in many cases be unavoidable, owing to the ewes being in too high condition ; but this the shepherd should try to obviate, by administering one or two doses of Epsom salts, which, by reducing the plethora, will increase the activity of the animal, and render it in many ways more prone to pregnancy.

As it is an object of some importance to retard the yeaning of gimmer hogs till the spring be well advanced, the rams are never sent to them till a fortnight after they have been put to the older ewes. Much nicety is always required in choosing the time at which rams should be put to gimmers, as they are in general sorry nurses, and sure, in bad seasons, to lose many lambs.

When a farm is provided with suitable enclosures, careful selection of both ewes and rams should always be attended to, taking care to make the good points of the one remedy the defects of the other ; but where a farm is destitute of such accommodation, the next best plan is to send the finest rams to the ewes for a few days before the rest of the males are admitted.

Great ewes ought always to be well looked after. The driest and best sheltered fields should be set apart for them, and turnips, when forming part of their food, should, when they are about to yearn, always be carted to their pasture. When they roll *awald*, and cannot regain their feet, prompt assistance should be afforded them, else they will soon die. Death in this case occurs from suffocation, though the morbid appearances exhibited by the carcass are frequently mistaken for those of braxy. Udder locking ought never to be attempted, as it often leads to abortion, and is, besides, not of the slightest utility.

(97.) *Early Lambs.* Though in the greater number of our breeds the arrival of the rutting season is fixed and regular, yet there are several in which pregnancy may, by proper management, be induced at any period. Of these the Dorsetshire and Wicklow varieties are the most noted, and are on this account selected for the rearing of house-lambs in the vicinity of towns, the inhabitants of which are opulent enough to create a demand for so expensive an article.

The beginning of June is the time chosen for the admission of the rams, so that by the month of January the greater proportion of the ewes have yearned. According to the plan pursued in Middlesex, " The

sheep, which begin to lamb about Michaelmas, are kept in the close during the day, and in the house during the night, until they have produced twenty or thirty lambs. These lambs are then put into a lamb-house, which is kept constantly well littered with clean wheat straw ; and chalk, both in lump and in powder, is provided for them to lick, in order to prevent looseness, and thereby preserve the lambs in health. As a prevention against gnawing the boards, or eating each other's wool, a little wheat straw is placed, with the ears downwards, in a rack within their reach, with which they amuse themselves, and of which they eat a small quantity. In this house they are kept with great care and attention until fit for the butcher.

“ The mothers of the lambs are turned, every night at eight o'clock, into the lamb-house to their offspring. At six o'clock in the morning these mothers are separated from their lambs, and turned into the pastures ; and, at eight o'clock, such ewes as have lost their own lambs, and those ewes whose lambs are sold, are brought in and held by the head till the lambs by turns suck them clean : they are then turned into the pasture ; and at twelve o'clock, the mothers of the lambs are driven from the pasture into the lamb-house for an hour, in the course of which time each lamb is suckled by its mother. At four o'clock, all the ewes that have not lambs of their own are again brought to the lamb-house, and held for the lambs to suck ; and at eight, the mothers of the lambs are brought to them for the night.

“ This method of suckling is continued all the year. The breeders select such of the lambs as become fat

enough, and of proper age (about eight weeks old) for slaughter, and send them to the market during December, and three or four succeeding months, at prices which vary from one guinea to four, and the rest of the year at about two guineas each. This is severe work for the ewes, and some of them die from exhaustion. However, care is taken that they have plenty of food ; for when green food (viz. turnips, cole, rye, tares, clover, &c.) begins to fail, brewers' grains are given them in troughs, and second-crop hay in racks, as well to support the ewes as to supply the lambs with plenty of milk ; for if that should not be abundant, the lambs would become stunted, in which case no food would fatten them.

“ A lamb-house to suckle from one hundred and sixty to one hundred and eighty lambs at a time, should be seventy feet long and eighteen feet broad, with three coops of different sizes at each end, and so constructed as to divide the lambs according to their ages.”*

In the county of Wicklow it is the practice to divide the twenty-four hours by four equal periods, and to feed the lambs with ewe's milk and cow's milk alternately. When commencing with cow's milk, a quarter of a pint is given, twice a-day, to each lamb, and this is gradually increased to a pint, exclusive of the milk from the ewe. This method of feeding has been cavilled at, but I think unjustly, as the ewe is thus saved from the bad effects of exhaustion, and the lambs are fit for the butcher when six weeks old, or sooner.

* Middlesex Report, p. 355.

(98.) *Lambing time.* When the ewes begin to drop their lambs, a time which ordinarily happens in the first or second week of April, but which, in other modes of management, must be dated twenty-two weeks after the tupping season, the shepherd has many calls upon his skill and watchfulness. In bad seasons, sheep are apt to prove unkind to their offspring, and none more so than the Cheviots. In this event, the best pastures should be selected for them, or turnips may be carted to them; but as gimmer hogs are often quite incapable of furnishing the necessary quantity of milk, the shepherd ought always to be provided with a bottle of milk, which he should drop from his own mouth into that of any lambs which may require it. Such mothers as appear to suffer in bringing forth, should be relieved with the utmost gentleness; and when a miscarriage occurs, if the weather be at the same time unfavourable, the dam ought to receive the shelter of a roof. When the ewe is lost in yeanning, her lamb, if it survive her, must be reared by another dam. Some little artifice is always necessary to induce a ewe to adopt the offspring of another. Covering the lamb with the skin of her own dead one, is sometimes resorted to, but this is hardly required, as any dam will take to another's offspring if the parties be shut up for some time together. Ewes that are late in lambing should be collected together, so as to be more under the care of the shepherd, and ought to be well fed, for the sake of bringing forward their lambs. Those lambs which are very far behind the rest must be prepared for the butcher, as they would make but a poor figure at the Lammas sales.

(99.) *Washing.* The time for clipping varies much, being earlier in seasons which have been preceded by favourable weather and an unstinted allowance of food, than in such as have followed a rigorous winter, disease, or any other cause calculated to arrest the growth of wool. The season may be said to be limited by the middle of May and the middle of July ; but this should not be taken as a rule of conduct, the best guide being the state of the new coat, which ought always to be well above the skin before shearing is attempted. The wool, unless among some mountain flocks, is always, in this country, washed prior to its removal from the sheep's back ; but in Spain that operation is always deferred till the fleeces have been collected, when they are subjected to a thorough scouring, in public buildings appropriated to the purpose, and termed *lavatories*. This is a plan in many respects superior to ours. Its adoption by our farmers has been recommended by Dr Parry. There cannot be a doubt of its being the preferable mode as regards the saving it would effect in the lives of sheep ; but as it is well known that shearing is much facilitated by washing, and that on the neatness with which the clipping is accomplished the quality of the succeeding crop in a great measure depends, some little time will be necessary to determine the comparative value of either mode. In New South Wales it is customary to make the sheep swim across a stream for two or three mornings before being washed, by which means the yolk is softened, and the removal of grease and dirt much promoted ; but this, though a good plan in that mild and *even climate*, could not be looked upon as safe in a

temperature so variable as that of Britain. In cases, however, where great nicety is required, the plan in vogue in the former country, that of dipping each sheep, before washing, into a caldron of warm water, might be beneficially adopted.

Mountain sheep are cleaned by being forced to swim across a pool, but the finer or lowland breeds are washed entirely by the hand. The latter method alone demands a short explanation. Dry, and, if possible, sunny weather, is selected for the operation, on the morning of which the lambs are separated from the flock, and the latter is conveyed to the margin of some pebbly-bottomed pool. Here they are penned or otherwise kept together, while they are seized, one by one, by a man standing mid-thigh deep near the water-edge, and turned back downwards, the head alone being above the surface. Plate V. fig. 1.* It is then turned from side to side, and moved backwards and forwards, so as to make the wool catch upon the stream and wave about. When the first washer has held it for a few minutes, and partially cleansed the fleece, he passes it *up the river* to the next, who goes through the same routine, and, on being convinced that the skin is free from filth, compels the sheep to land by swimming in an oblique direction up the water. Three and even four men are sometimes employed in washing sheep, but two, as here described, will, under ordinary circumstances, be found sufficient. The bank on which the dripping sheep are collected, should have a clean and firm turf,

* For the figures 1, 2 and 3 in Plate V. I am indebted to the *Quarterly Journal of Agriculture* for 1832, p. 269.

and the flock should, till fairly dry and fit for shearing, be kept on heavy grass land, or, what is better, in straw-bedded folds.

(100.) *Shearing.* After allowing eight days, off or on, to elapse from the time of washing, so as to permit the wool to gain a fresh supply of yolk, and along with it lustre and elasticity, the sheep may be stripped of its fleece. As there is no saving in employing an unskilful clipper, every encouragement should be given to induce servants to cut close, smoothly and evenly, and to avoid injuring the skin, or going twice over the same part. There are two ways in this country of depriving sheep of their wool. In the first, or coarser method, which is only adopted in the case of Cheviot and heath sheep, the operator sits upon the ground, and placing the animal on its back between his knees, shears the wool first from the belly and legs, and then, after tying the latter, proceeds to clear the back. In the second method, the legs are never tied, as the disposition of the sheep is such as to render it unnecessary. The animal is placed as in Fig. 2, Plate V., and the shearer clips first one side, cutting from the middle of the belly to that of the back, down to the loins. It is then placed on its side, as in Fig. 3, Plate V., the knee of the operator pressing on its neck, and the wool is removed from the legs and buttocks. The fleece is next rolled up, with the cut side outwards, commencing at the tail, and using the wool of the other extremity as a fastening for the bundle.

A cool dry apartment should be selected in which to store the wool, always remembering that *heat* and *damp* are equally injurious to it, and that the greater

the perfection in which it retains its *natural oily moisture*, the more valuable will it prove both to the grower and the manufacturer.

(101.) *Weaning*, where milking is not practised, ought to be set about in the end of July or beginning of August. In some places the ewe lambs are never speaned, but allowed to go at large with their mothers ; and though by this plan the dam is apt to be kept in poor condition, yet is this counterbalanced by the comparative freedom of the hogs from braxy. As an improvement, however, the gimmer lambs may be withheld for a fortnight from their mothers, and at the end of that time may be permitted to pasture with them. In the few places where the farmer continues to manufacture ewe-milk cheese and butter, speaning is carried into effect somewhat earlier, and is of course attended, in the long run, with no little detriment to the stock and its proprietor. The sooner that the practice be laid aside the better ; for though ewe-milk cheese is pretty universally relished and admired, yet those who are acquainted with the scenes which happen at the bughts, know well that the cheese itself cannot but contain much, the mere mention of which would pall at once the appetite even of the least fastidious. In addition to this, a great waste of grass is occasioned by the sheep going to and from the bught, while the inconveniences they are on every hand exposed to, a season when they are peculiarly liable to disease and accident, ought of themselves to lead to the abolition of the practice.

When the udders of the ewes appear, after their separation from the lambs, to be much distended, they

may be once or twice milked, to prevent bad consequences ; but it is much better to obviate the necessity for this, by reducing their allowance of food for a few days. When the animal seems to suffer much irritation about the udder, it will always be safe to give a brisk dose of any of the common saline purgatives.

The store lambs are at this period sent to good pasture, or, where the farm cannot afford it, are *summered* at a distance ; that is to say, the farmer pays so much a head for permission to feed his flock, during a couple of months, on another person's ground, at the end of which period they are turned upon the pasture which has just been vacated by the gimmers, they having been sent to join the older ewes.

(102.) *Smearing*, in those places where it is still carried on, is performed in two ways, according to the quality of the wool. *Slipping*, as the one method is termed, is only employed in high, wet districts, where the sheep are covered with long wool ; while *rolling*, as the other is usually called, is only required for such as, in dry situations, are surrounded by a short close pile. In pursuing the former plan, the smearer takes up the mixture on the forefinger of his right hand, and while holding the locks of wool apart with his arms and left hand, allows the salve to drop into the groove or shed, along which it is spread by the other fingers.

In *rolling*, a small quantity only of smearing stuff is raised on the *point* of the forefinger, with which it is laid evenly upon the skin. This is by far the neater way of salving, as less of the ointment is permitted to get upon the wool ; but as it is altogether a tardier process, it is not so frequently resorted to.

November is the month usually chosen for this operation, but as it cannot be properly done unless the day fixed upon has been preceded by dry weather, the time ought rather to be selected by the aspect of the season.

The composition of smearing stuffs is so very various, that it is quite beyond my power to give the reader even a list of the ordinary ingredients and their proportions ; nor need I recommend any of them in particular to the attention of the shepherd, knowing, as I do, the bigoted opinions which are held upon the subject, and the aversion with which every one regards a mixture not of their own composing. I can only observe, that where tar is employed, it ought to be well diluted with grease, so as to enable two English quarts of it to be spread over six sheep. In this way it will be less liable to adhere to the wool, and will be much more readily laid upon the skin. When sheep are salved without due attention to the even spreading of the mixture, the insects with which the skin is infested are, instead of being destroyed, allowed here and there a resting place ; and as the severity of their attack is in proportion to the limited nature of their range, the skin at these points soon becomes crusted with scabs. The smaller the quantity of tar employed, as consistent with the keeping down of vermin, so much the better, as the wool is of more value to the manufacturer, the sheep is saved the discomfort of having its fleece plastered and matted, and the shepherd is spared the vexation of losing lambs through their inability to reach an udder surrounded by locks of hard and tangled wool.

(103.) *Fatting.* The age at which sheep are prepared for the butcher depends upon the breed, its situation, and its propensity to take on fat. The heath sheep may be considered as requiring to be the greatest length of time in the hands of the farmer, and the Leicesters as the reverse; wethers of the former variety being usually disposed off when from three to four years old, and ewes when from four to five; while wethers of the latter kind are fit for market often at eighteen months, and the ewes are in general fed off after the third year.

Sheep, in spring and autumn, are peculiarly liable to diseases of the intestines, a circumstance mainly to be ascribed to the changes which are, in these seasons, constantly occurring in the nature of their food. Much of this is owing to careless management in the economy of the pastures, and to restricting them for great lengths of time to one kind of provender, a thing guarded against by all good breeders. Sudden transitions, however, from a poor to a nutritive pasture, and the reverse, are always bad, and therefore to be avoided; but change of feeding ground, with these restrictions, cannot be too much inculcated—it is, in fact, the soul of sheep husbandry. The bleakest portions of a farm should be pastured off in autumn, so as to reserve the sheltered spots for winter use. The cast ewes may then be drafted off to feed on a more succulent herbage, previous to being penned on turnips.

Most of the points worthy of attention in sheep feeding having already been detailed in the article on *Crossing*, I shall only add a few particulars in regard to *management* on turnips.

When sheep are fed on turnips, they are in general confined to a particular portion of the field by nets or hurdles. The latter, when made of Scotch fir, cost about a shilling each ; but, when constructed of larch, the price is fourteen-pence. Those made of larch are by far the more durable, and will last three years if kept under cover during summer. Two men are required to set them up, besides a horse and cart to take them to the field, on which account nets have a decided preference, being easy of transportation, and requiring little house-room. Though valuable in windy situations, nets cannot be used to enclose horned sheep, as their heads become entangled with the cords. They will seldom serve for more than three years, but as they cost only threepence per yard, they may be considered as every way cheaper than hurdles.

When the turnips allotted to the sheep, which seldom exceed a week's supply, are consumed, another portion of the field is enclosed ; while the shells are torn up with a two-pronged hook, and either left there to be consumed by the flock, or carted to another field for the use of sheep not then intended to be fattened. A fresh supply should always be afforded them before the old one is eaten clean, otherwise their fattening will be much retarded. It is usual to allow them at the same time plenty of salt, placed up and down the field in troughs or boxes,* and about a ton of hay in the ten or fourteen days, to every hundred sheep ; though that

* Old casks, wanting ends, form the best of all contrivances for holding salt for sheep, as when laid on their sides, and retained in that position by stakes, they allow the sheep free admission, at the same time that the salt is defended from rain.

number, if supplied with water, and permitted to run about, will consume that quantity in a week. In spring, from half a pound to a pound of oil cake is given daily to each of them, along with turnips.

In places where the cold during spring is any way severe, the Swedish turnip ought always to be preferred for feeding sheep, as from the formation of the upper part of the bulb, water cannot collect within it as it does in other varieties, to their serious injury when frost sets in.

Turnips must be cut for such sheep as are shedding their teeth. The mouths of those that refuse to eat them should be examined, that in the event of a tooth being loose or broken it may be removed. Occasionally a sheep will be unable to gnaw a turnip, owing to a peculiar formation of the head, the lower jaw being so very short as to give the profile some resemblance to that of a pig. Such deformed animals are said in this quarter to be *grun*-(ground)-mouthed: I believe from the elongation of the nose suiting them better for poking in the earth than for feeding in the usual way.

The fattening of sheep on turnips is much promoted by their having access to a grass field, more especially if it happen to contain whins or heather. It is from want of attention to this that sheep are so liable to disease when eating turnips, for, apart from the benefit that accrues to them from a dry lair, they are enabled to turn their food to better account when consuming bitter herbs. It is no unusual thing for turnip-fed sheep and cattle to become quite lean, as the farmers say, "*almost at the lifting*," for no other reason than

that they have been confined too strictly to one article of diet. They have been denied access to plants containing of all things the one most necessary for the maintenance of their health—*bitter extractive matter*—as it is called by chemists—without a due proportion of which the most nutritious substances cannot be turned to account. “As an essential ingredient in the provender of herbivorous animals, it may, I think, be admitted as a fact, that its importance is *in an inverse ratio* with the nutritive powers of the food.”* Thus accounting for the length of time that sheep will continue to thrive on turnips alone.

With all the advantages, however, which accrue to the sheep when on turnips, from the quantity of nutritive matter which these roots contain, its progress when restricted to them frequently falls very far short of the expectations of the owner. In the greater number of instances, also, farmers are unable to account for their want of success in this department, so that I may be excused for endeavouring to point out, at some length, the causes of their failure. To proceed :—

The point in sheep management in which our farmers are most deficient, is turnip-feeding ; one upon which most will pique themselves as being perfect, though, speaking guardedly, hardly one man in twenty understands the rudimentary principles on which sheep-feeding should be conducted. They are unacquainted with the habits of the wild animal, and, unlike any other class of men, interest themselves little in the fundamental study of their calling. There is not a showman,

* *Paris's Pharmacologia*, sixth edition, vol. 1. p. 147.

or a bird-fancier, but knows to a tittle the peculiarities of the creature that he has in charge, and endeavours to the best of his ability, to provide such food as its instincts crave. Not so, however, with the store farmer. He cares not to inquire whether the sheep is naturally calculated to subsist on one kind of nutriment; and if so, whether they will, when left to the exercise of instinct, resort to turnips of their own accord; whether the sheep is usually restricted to confined localities similar to our fields, or is the unrestrained rover over an extensive pasture. Yet it is from investigations of this kind that we are to derive our mode of treating sheep, and are to form plans beneficial to ourselves, from their being, in a manner, improved upon nature. We find, from a perusal of the works of travellers, and from the anatomical peculiarities of the sheep, that it is fitted for residence in countries precipitous in surface, and scantily supplied with herbage; consequently, it must range over a vast extent of ground for a subsistence, and its food must, owing to the varied features of the country, consist, not of one or of a few plants, but of a most extensive mixture of herbage. Experiment also points out that the deductions from these observations are correct. Sheep, in fact, consume a greater number of plants than any other domestic animal. Linnæus, in examining into this subject, found, by offering fresh plants to such animals in the ordinary mode of feeding, that horses ate 265 species, and refused 212; cattle ate 276 species, and refused 218; while sheep took 387 species, and only refused 141. We find, too, great difficulty in preventing sheep from springing over the dykes and hedges

that we place as boundaries to their rambling habits, yet how seldom do we see the true cause of their determination to set them at defiance. We may partly account for it by considering their analogy to the goat, and their propensity to scale rugged eminences ; but I think these movements rather indicate an anxiety to change a pasture already exhausted of variety, for fresh fields, and herbage abounding in that miscellaneous provision which nature apparently reckons essential for them. Shepherds own as much, and will tell you that frequent change of pasture is the soul of sheep husbandry, though they see no reason why sheep should not be kept for many successive weeks on a patch of turnips. They admit the necessity of a frequent shifting in the one case, but deny it in the other. Magendie, a celebrated French physiologist, has shown, by experiment, that it is impossible to keep an animal in a healthy state longer than six weeks on one article of diet, death frequently taking place even before the end of that period ; but our sheep-farmers, in happy ignorance of the fact, confine their flocks for months to turnips only. And what, may I ask them, is the consequence of the practice ? Why, that it is not unusual to meet with sheep-owners who lose at least one out of every fifteen, and all owing, as may easily be proved, to this mode of management. In the first place, the turnip is a kind of food entirely foreign to the nature of the sheep, and one to which, at first, they evince great repugnance. There are many varieties of sheep incapable of feeding on turnips, owing to the form of the face, the upper-jaw projecting considerably past the lower, hindering the chisel-shaped teeth from being brought to bear upon

the root. None of our British breeds certainly have this as a regular feature, nevertheless they are liable to it; and there are few farmers that have not, several times in their lives, met with *grun-mouthed* sheep, as they are called in Scotland, from their profile resembling that of the pig, and suiting them for poking in earth, rather than for eating in the usual way. Again, if the structure of the sheep's mouth proves that it is not adapted for eating turnips, the composition of the turnip no less satisfactorily shows that it is not calculated as food for sheep. Bitterness is essentially necessary in the food of all herbivorous animals; without it, indeed, they sooner or later fall into ill health. This property is shown by chemists to reside in the extractive matter of plants, which has, therefore, been called *bitter extractive*. The quantity is also found to be in the inverse ratio of the nutritive powers of the plant; that is to say, where the plant abounds in alimentary matter, the proportion of bitter extractive is small, compared with what it is where the former is deficient. Turnips contain a large quantity of matter capable of affording nourishment to the body, but they yield little or none of the bitter principle. In consequence of this, sheep acquire fat rapidly for a time, when placed on turnips; but, experiencing a want of the medicinal bitter, begin with equal rapidity to lose the advantages they so recently gained. Their appetite becomes depraved, and, from being shut out from access to the stomachic intended for them by nature, they take to devouring earth, or any substance capable of serving as a substitute for it. "With regard to the natural use of bitter extractive, it may be laid down

as a truth, that it stimulates the stomach,—corrects putrefying and unwholesome nutriment,—promotes tardy digestion,—increases the nutritive powers of those vegetable substances to which it is united,—and furnishes a natural remedy for the deranged functions of the stomach in particular, and through the sympathetic medium of that organ, for the atony of remote parts in general.”* All, indeed, concur in setting a high value on this constituent of plants—all, with the exception of those whose interests are most deeply concerned in a knowledge of its importance. Farmers, in general, cannot perceive the utility of attending to concerns apparently so trifling, though in the right conduct of these they depend materially for success. Nay, I have known men arguing, that in six weeks they have given ordinary sheep an excellent coating of fat, by keeping them on turnips only; though, on strict inquiry being made into the nature of the field in which they had been penned, it has always turned out that the sheep had access to other things, their owners having wilfully shut their eyes to the true circumstances of the case. Depend on it, no sheep will continue in health during six weeks on turnips alone, much less will it continue throughout that time to take on fat. Much of the mischief attending a want of bitter matter is obviated by the plan of allowing the sheep corn, salt, oilcake, and hay, which, serve, especially the last, as tolerable substitutes for it. Good hay ought always to be plentifully supplied to sheep on turnips, as, from the variety of the plants composing it, it contains much that is not

* Paris's Pharmacologia, vol. i. p. 141.

to be found in turnips. Besides, one of the most useful bitters with which we are acquainted (the *Bogbean*—*Menyanthes Trifoliata*) occurs in meadow hay, and is a plant sufficient of itself to save the animal from the consequences of neglect. Whenever you hear of remarkable instances of sheep becoming quickly fat on turnips, you may safely believe they have had liberty to nibble something in addition to the ordinary provender. They have had access to broom or whins, perhaps only to bushes that are laid as a defence on dykes, or only to the scanty pickings on the edges of fields—still they have by such means in a manner satisfied the craving for bitter aliment, and enabled their stomachs to turn to better account the otherwise unprofitable turnips. Broom is at all times an excellent medicine for sheep, and one which they are partial to, and which ought, therefore, to be placed, if possible, within their reach.

CHAPTER VI.

ACCIDENTS AND OPERATIONS.

(104.) Sheep being about as liable as other animals to a variety of accidents, it is necessary that the shepherd should possess a competent knowledge of the means which art affords for the remedy of those mishaps. It is from a want of such knowledge that farmers are frequently led to slaughter valuable sheep, though *only labouring* under the effects of some commonplace

disease or accident. If the animal is attended by a professional person, an expense is sure to be incurred nearly equal to the worth of the patient, and in so far as they endeavour to obviate this, by killing the sheep, they are free from blame ; but why not rather contrive to save the cost of veterinary attendance, by making themselves conversant with its diseases, and able to prescribe for their own flocks, in which there can be no difficulty, as the remedies are, in the majority of cases, few, simple, and of easy application. In the surgical and medical management of flocks, much mystery has, as in other matters, all along existed ; but that fantastic age is well nigh its close, and thanks to the spirit of candid inquiry now abroad, we may hope ere long to boast of valuable information in this department. The spread of correct ideas regarding the nature and treatment of accidents and diseases, has from first to last been prevented by the diffuseness of those who have written on the subject, and by their so clothing it in a mass of verbiage, as to render scarcely intelligible what would otherwise be easy of acquirement. To obviate the liability to a similar charge, the following observations are given as briefly as is consistent with a due regard to the importance of the subject.

(105.) *Wounds.* All the wounds which can be inflicted may be classed under the heads of incised, punctured, and lacerated.

An incised wound is one made by a cutting instrument, such as a knife or a piece of glass.

Punctured wounds are those produced by sharp pointed bodies, such as pins or thorns.

Lacerated wounds are those occasioned by blunt

bodies, as the teeth of the dog, tearing rather than cutting the flesh.

When a sheep has received any of these injuries, the following rules ought to be attended to, and in the order here recommended :—

1st. Arrest the bleeding, if profuse, and likely to endanger life.

2d. Clip away the wool for a few inches around the injured part.

3d. Remove dirt or other foreign body from the wound.

4th. Bring the separated parts as nearly together as circumstances will at the moment permit, and retain them there by suitable apparatus.

(106.) *To stop Bleeding.* Bleeding will, if no large arteries are divided, cease on the free exposure of the surface for a few minutes to the air ; but when a large vessel has been cut, more determined means must be had recourse to. Pressure on the bleeding surface and its neighbourhood will in many cases succeed, but this or any similar method is far inferior to that of securing the open vessel by a thread. To accomplish this, the mouth of the vein or artery must be slightly drawn out from the contiguous surface, by means of a small hook, called by surgeons a tenaculum, and easily procured from any blacksmith. While the mouth of the vessel is thus held exposed, an assistant must surround it with a noose of thread, which, on being secured with a double knot, will effectually close it. The thread ought to be of white silk, though any undyed thread, which is firm, round, and capable of standing a pull, will answer the purpose. Care must be taken to

place the thread, before tying it, fairly behind the point of the tenaculum, so as to avoid including the instrument within the ligature, a circumstance which would lead to the slipping of the noose and failure of the operation. The hook is now to be withdrawn, and one end of the ligature cut off by scissars within a little of the noose. The remaining threads are allowed to hang out of the wound, so as to admit of their removal when they become loose, which does not, however, take place till the termination of the first four days, and they are frequently retained for a much longer period. At each time the wound is dressed, after the fourth day, the ligatures should be *gently pulled*, or, which is preferable, *twisted*, to disengage them, if at all loose, so that the wound may be more speedily closed. Before proceeding to any operation where bleeding is expected, the operator should provide himself with a few well-waxed threads, each twelve inches long, so that no delay may ensue on a division of large vessels.

(107.) *Removal of Extraneous Matter.* Dirt is best removed by washing with a sponge or old linen rag and warm water. Other foreign bodies may in general be extracted by the finger and thumb. In some cases, however, it may be necessary to dilate or enlarge the wound with a fine-edged knife, in order to facilitate the removal of substances which, from their shape or situation, cannot be otherwise displaced.

(108.) *Closure of a Wound.* The last thing to be done is to bring the edges of the wound into as accurate contact as the state of the parts will at the moment permit, without, however, using any force. This, with

a little care, is readily accomplished, the only difficulty being to retain them in the desired position. They may be held in contact either by *stitches*, (sutures), *plasters*, or *bandages*, or by a union of the three. Stitches are only required when the wound gapes to a considerable extent, as it will always do when run across a muscle. They may be applied in the following manner. Transfix one side of the wound with a curved needle (armed with a well waxed thread) from the needle *from without* obliquely towards the bottom of the wound, then carry it through the opposite side *from within*, taking care to bring it out about the same distance from the edge as that at which it entered the other margin. The needle must now be removed by cutting the threads close to its eye, and while the ends are allowed to hang loose, the same operation should be repeated, at the distance of an inch or an inch and a half from the first stitch, as often as the length of the wound may render necessary. The assistant will now bring the sides of the wound together as accurately as possible, and retain them together till you have tied the corresponding ends of the threads in a double knot.

(109.) *Bandaging*. Adhesive plaster is in some instances of service, but upon the whole ought rarely to be dispensed with, being of difficult application, moreover tending to the accumulation of filth and discomfort of the animal. Nothing will be found to serve the purpose of supporting the parts so well as a properly adjusted bandage, which is useful in every instance, and sure to stay on if sewed here and there to the fleece. The bandage should never be omitted.

where the wound has any tendency to gape, as too great a strain upon the stitches cannot but lead to delay in the healing process. In bandaging a limb or part of a limb, commence *always at the foot*, and proceed upwards; in other parts of the body begin where you find it most convenient. Before applying a bandage to an injured surface, a couple of pieces of old linen or cotton rag should be folded into pads or compresses, and laid *one on each side of the cut*, and over these the bandage should be rolled, evenly and with moderate and uniform firmness. By this plan the separated surfaces are supported and preserved in close juxtaposition, especially at the bottom of the wound, a thing of some importance where the cavity is deep. Transverse cuts of the limbs of sheep require more careful and more complicated treatment than cuts in other parts, as there is a constant tendency of the edges to retract. This retraction of the edges may be in some degree obviated by the application of a splint, which may be made of a slip of stiff leather (such as is used for saddle flaps) well wetted, so as to be easily adapted to the form of the limb. It is intended to impede the motion of the leg, which occasions the gaping of the wound, and must therefore be made to pass over one or more joints as circumstances may require. Tow must be laid along the surface (a sound one if possible) on which the leather is to be placed, and a bandage then rolled over it so as to make all secure.

(110.) *Clean cuts*, as every one knows, heal readily in a healthy animal, seldom demanding above three dressings; lacerations, on the other hand, require a longer period for their reparation, inasmuch as the

process which nature goes through is more complicated. In the former, the parts are speedily glued together, so soon almost as in contact, and the union is generally complete within the first thirty-six hours. Not so, however, with the latter. Here the parts are bruised, torn, and perhaps to a considerable extent awanting. Some of the bruised portions may die, and are of course to be renewed. This is a process requiring a great effort on the part of the vital powers, which are often inadequate to the task, and on this account we ought, when the injury is severe, to sacrifice the animal rather than run the risk of its dying during the process of the attempted cure. To replace the lost part, suppuration, or the formation of *matter* commences; while under cover of this, a crop of fleshy particles (*granulations*) rise to fill the vacancy. Granulations are best promoted by warm emollient applications, such as poultices of oatmeal, linseed-meal, or barley-flour, which ought to be frequently renewed to prevent their becoming cold or dry. When the granulations become too luxuriant, and rise, as they are apt to do, above the level of the skin, the poultices must be laid aside, the sore washed once or twice a-day with a *solution* of sulphate of copper (made by dissolving two or three drachms of blue vitriol in an English pint of soft water), and covered carefully over with a pledget of fine tow, spread with lard, or any simple ointment, by which means, conjoined with cleanliness, a cure will easily be accomplished.

(111.) *Punctured Wounds.* The orifice being small in these, and the depth considerable, the sides are apt to *adhere irregularly*; and prevent the free escape of

matter, which is certain to collect at the bottom. To avoid such occurrences, it is in many cases proper to convert a punctured into an incised wound. When, from neglecting this, the matter is denied an outlet, an incision must be made to allow it to escape, otherwise much harm will ensue from its burrowing between the different textures. Fomentations will also here be serviceable, and should be preferred to poultices. To apply them, place well-boiled meadow hay, when very hot and moist, within a fold of old blanket or woollen cloth, and lay it on the injured parts, taking care to renew the heat frequently, by dipping the bundle in the hot decoction.

(112.) *Bruises and Sprains.* These, unless severe, need not be interfered with. When the shepherd, however, considers it necessary to make any application, he cannot do better than foment the part for an hour or so with meadow hay, in the same manner as recommended for punctured wounds.

(113.) *Wounds of Joints.* Such wounds are highly dangerous and apt to baffle the most experienced. *The grand object in every case, however, where a cure is attempted, is to produce a speedy union of the wound, as directed in (108) to (109).* If the injury be extensive, the best thing the farmer can do is to slaughter the animal.

(114.) *Poisoned Wounds.* It is said that sheep are sometimes bitten by snakes, and strange stories are told of their milk being sucked by these reptiles. In such a case but small dependence can be placed on any inward treatment, beyond the administration of one or two full doses of castor oil. If the bite can be

discovered, the part should be frequently fomented with a decoction of meadow hay and foxglove (*fairy-cap* of the Irish, and *bluidy-finger* of the Scotch).

(115.) *Fractures.* If there be no wound of the soft parts, the bone being simply broken, the treatment is extremely easy. Apply a piece of wet leather, as recommended at (109), taking care to ease the limb when swelling supervenes. When the swelling is considerable, and fever present, you cannot do better than open a vein of the head or neck, allowing a quantity of blood to escape, proportioned to the size and condition of the animal and the urgency of the symptoms. The exhibition of purgatives should never be neglected. Epsom salt, in one ounce doses, given either as a gruel or a drench, will be found to answer the purpose well. If the broken bones are kept steady, the cure will be complete in from three weeks to a month, the process of reunion always proceeding faster in a young than in an old sheep. Should the soft parts be injured to any extent, or the ends of the bone protruding, recovery is very uncertain, and it will become a question whether it would not be better at once to convert the animal into mutton; indeed, removal of portions of bone and amputation, of which some well known writers on the surgery of the sheep speak so learnedly and confidently, may be viewed, as, in this case, chimerical, if not absurd.

OPERATIONS.

(116.) *Cutting Lambs.* Polled sheep should be castrated about the tenth day after birth, but the end of the fifth week is soon enough for horned sheep, as *early castration* has always a tendency to spoil the

beauty of the horns. The risk is always in proportion to the age, therefore no great length of time ought ever to elapse from the period of birth to that of the operation. A large flock of ewes and lambs should never be collected preparatory to cutting, as the latter, from the excitement and crowding, are less likely to recover from the operation. It is much better to take up a small number so soon as they are ready. Instead of driving them about in attempts to secure them, it will be safer to station a person at a division of the fold, who may lay hold of them individually as they are made to pass through slowly. The best method of cutting is to grasp the bag containing the testicles with the left hand, so as to tighten the skin, and push them forward, after which an incision may be made through the skin at the end of the bag, large enough to permit the stones to pass. They may then be removed either by cutting or tearing; the latter plan, however, is the better, as there is little risk of bleeding, which is almost sure to prove troublesome if the former be adopted. At this time a portion of the tail ought to be removed, if it has not been done at an earlier period, as a remedy for pinding. The bleeding will serve to lessen the danger consequent on the previous operation. When all have been operated on, the ewes may be allowed to find their lambs, and the whole conducted *quietly* to their pasture.

(117.) *Blood-letting.* In describing this operation, too much stress is always laid on the importance of opening particular veins, or divisions of a vein, in certain diseases. Such directions are altogether unnecessary, as *it matters not from what part of the animal*

the blood be drawn, provided it be taken quickly. Nothing tends so much to the recovery of an animal from a disease in which bleeding is required, as the rapid flow of the blood from a large orifice. Little *impression* can be made on an acute disease by the slow removal of even a large quantity of blood, as the organs have time to accommodate themselves to the loss, which might, for any good it will do, as well be dispensed with. Either bleed rapidly or not at all. The nearer the commencement of an ailment, in which you employ bleeding, the operation is resorted to, the greater the chance of its doing good; no time ought, therefore, to be lost in using the lancet, when once it is known to be required. Bleeding by nicking the under surface of the tail does very well where no great deal of blood is required, but it is not to be thought of if the veins of the face or neck can possibly be opened. These are to be taken in preference to a vein on the leg, as they are much more readily got at. The facial vein (*f. v.* Fig. 3. Pl. III.) commences by small branches on the side of the face, and runs downwards and backwards to the base of the jaw, where it may be felt within two inches of the angle, or opposite the middle grinding tooth. It is here that the orifice must be made, the thumb of the left hand being held against the vein, so as to prevent the flow of blood towards the heart, will make it *rise*. Some prefer opening the jugular vein (*j. v.* Fig. 3. Pl.), which commences behind the eye and runs down the side of the neck. This vessel is, however, more difficult to open than the former, being better covered with wool, and not so easily exposed or made to swell. *Stringing* is the mode commonly resorted to for this

end; that is to say a cord is drawn tightly round the neck, close to the shoulder, so as to stop the circulation through the vein, and render it perceptible to the finger. A lancet is the instrument generally used in bleeding, though a well-pointed pen knife will do at a pinch. The opening must always be made obliquely, in the direction marked in the cut; but before attempting this, the animal must be secured, by placing it between the operator's legs, with its croup against a wall. The selected vein is then fixed by the fingers of the operator's left hand, so as to prevent it rolling or slipping before the lancet. Having fairly entered the vein, the point of the instrument must be elevated, at the same time that it is pushed a little forward, by which motion it will be lifted from or cut its way out of the vein. *A prescribed quantity of blood should never be drawn*, for the simple reason that this can never be precisely stated. If the symptoms are urgent, as in all likelihood they will, your best plan is not to stop the flow of blood till the animal fall or is about to fall. When this occurs, run a pin through the edges of the orifice, and finish by twisting round it a lock of wool.

(118.) *Removal of Hydatids from within the head.* This animal, and the symptoms which it causes, I have fully described at (169). Their removal has been attempted in a variety of ways, but the simplest method, and one most likely to succeed, is that followed in this quarter. A couple of incisions, forming when completed the letter T, are made in the integument covering the soft part of the bone under which the hydatid is supposed to be. Two flaps are in this way marked

out, and are dissected back so as to expose the skull. The yielding portion of the latter is then pared away, which brings the sac into view. This will be seen alternately to sink and rise, following in this respect the motions of the brain. A moderate-sized needle, slightly curved and filled with thread, is now passed through the exposed portion of the cyst, and the thread allowed to remain. The fluid is thus permitted slowly to escape, and at the same time the sac becomes collapsed, after which it is easily removed by pulling gently at the thread with which it is connected. As good a hold should be taken with the string as possible, and all the water should be allowed to flow out before any attempt is made to extract the remains of the hydatid. To conclude the operation, lay down the flaps of skin in their original position, covering them with a small piece of folded linen smeared with lard, and over all apply a cap. Never try to save the bone which you cut, by turning it back in the form of a lid, for by so doing you will only endanger the life of the animal, which is otherwise in little jeopardy.

It will often happen that the hydatid, from being in the interior of the brain, will not be brought into view by the removal of a portion of the skull. In this case the brain must be punctured in order to reach the sac and evacuate its contents.

When the skull above the eye is very thin, the disease may be at once ended by cautiously thrusting a short, stout, sharp-pointed piece of steel wire through the skin and bone down towards the centre of the brain, taking care to pull the skin a little to one side before making the *puncture*, so that on letting it loose the openings in the

skull and integument will not be opposite to one another. This plan is much superior to that of thrusting a needle up the nostril, in the manner devised by Mr Hogg, as in his way we are always poking in the dark, in ignorance of the situation of the instrument, and are in all probability doing so much injury to the delicate parts within the nose as to preclude the possibility of recovery. Indeed, I some time ago examined a head on which Mr Hogg's operation had been twice unsuccessfully performed, and found traces of inflammation at the upper part of the nostril severe enough of itself to have occasioned death. The needle had not entered the brain, but the ethmoid was very much injured. I believe the instrument is very seldom pushed more than half way through the bone, at least it never reaches the hydatid, which would appear to be destroyed rather by the inflammatory process which follows the attempt, unfitting the brain for supplying it with the secretions on which it lives, than by any direct injury done to it by the needle.

CHAPTER VII.

DISEASES OF SHEEP.

(119.) There is no department in the management of sheep so little understood as the nature and treatment of their diseases. Every part of the sheep itself has been used, at one time or another, in this country, as medicine for *man*, a folly still prevailing among the

boors of Southern Africa, who, according to Thunberg, employ the inner coat of the stomach, dried and powdered, as a safe emetic. Quackish absurdities of so glaring a nature have, however, long been scorned in civilized society. Not so, however, when the sheep is the object of treatment. Scientific innovations have been slow in reaching it, and specimens of barbarian usage are far from rare. We may feel for the benighted credulity which could place reliance, for a rescue from mortal ailment, on the secretions or excretions of a sheep; but we are compelled to laugh on reading, in the *Family Dictionary*, published in 1752, the following:—

“In general, 'tis affirmed that the belly of a sheep boiled in water and wine, and given the sheep to drink, cures several diseases incident to them.”

Only fancy a farmer dosing a sheep with mutton broth, and adding, for its stomach's sake, a little wine! I suspect the prescriber was, in this instance, putting himself, in point of intellect, far below the level of his patient. Thanks to him, however, for the benefit he has thus unwittingly conferred, by holding ignorance up to the derision it so richly merits; no means being so powerful as broadly-drawn caricatures in exposing the extent of such delusions. Though faith has long since ceased to be reposed in the medicinal virtues of mutton broth, a variety of nostrums have from time to time appeared, the composition and application of which are invaluable for the amount of *negative* information they are calculated to convey. Further notice of these trashy recipes it is not my intention to take, as a list of them alone would make a volume;—they are in the hands of every one.

(120.) *Cautions in prescribing.* Great reliance is in general placed upon prescriptions, which profess to suit diseases in every stage and circumstance.—Than this, however, scarcely any thing can be more absurd. It is an opinion engendered not so much by ignorance as by laziness, a determination not to be put about by thinking of a remedy for the evils which surround us, but, while we contrive to soothe ourselves by doing *something*, to leave every thing to the hit-or-miss practice of charlatans.* There are many, who on being informed of the presence of disease in a neighbour's flock, confidently advise the employment of a favourite nostrum, on the empirical supposition that because it cured, or was thought to cure, one flock, it will cure another. Nothing is taken into account saving that, in both cases, the affected animals are sheep ; and it is at once concluded, that what benefited one will benefit another. The many niceties in prescribing are never thought of: oh no, that would be of no use! of course it can be of no importance to give a moment's attention to age and sex, pasture and situation, or to leanness or fatness, or to the presence of pregnancy! These are of trifling moment, and only to be despised by a person armed with a recipe, which some one has shown to be capable of walking like a constable through the body, and bearing off the intruder! But enough of this ; sufficient has, I think, been said to prove the utter folly of confiding in things of the above nature or intention, and to show that such confidence can lead to nothing

* Whenever we hear a person recommending a medicine of universal virtues, we may safely set him down either for a fool or an impostor. Things which are good for every thing are good for nothing.

but a waste of life and capital. Even though the remedy is a harmless one, it ought (unless calculated from *known* powers to arrest the disease) to be viewed with distrust, as incurring a loss of time, during which other and better measures might have been resorted to.

(121.) *Classification of diseases.** As the acquirement of correct ideas regarding the treatment of diseases is much facilitated by a simple arrangement of

* Diseases affecting	The Stomach and Intestines.	{ Blown or Blast. Braxy, Sickness, or Blood. Pining, Daising, Vinquish or Vanquish. Staggers. Diarrhoea or Rush. Dysentery, Cling, Breckshaw or Breckshuach.
	The Skin and Hoofs.	{ Scab or Itch. Erysipelas or Wild-fire. Red Water. Leg Evil or Black-leg.† Inflammatory appearances caused by the { 1. Maggot. 2. Ked. 3. Tick. 4. Œstrus bovis. Sore Teats. Foot-rot.
	The Air Passages.	{ Inflammation caused by the { 1. Œstrus ovis. 2. Pentastoma. 3. Strongylus filaria. Coryza.
	Glandular tissues, —viz. the Lungs, Liver, & Kidney.	{ Rot. Jaundice. Dropsy.
	The Brain and Spinal Marrow.	{ Sturdy, Gid or Dizzy, { 1. Hydatids or Blobs. caused by { 2. Hydrocephalus, or Water in the Head. Trembling, Thwarter or Leaping-ill. Wood Evil.
	The Eye.	{ Ophthalmia. Soft Cancer.

† Leg evil ought properly to be classed with diseases of the vascular system, being in many instances merely a symptom of disease in the heart or great vessels; but as the same results are arrived at by placing it under the present head, nicer distinctions would only tend to create confusion.

the diseases themselves, numerous attempts have been made to accomplish it, and in a variety of ways. The best of these tabular views with which I am acquainted is the one laid before the Highland Society some years ago, by Mr Stevenson, who appears to have been the first to publish any thing like a satisfactory classification. His arrangement is, however, defective in several points, more especially as it necessitates the placing in the same division diseases of organs essentially different. Thus he is compelled to admit under "Diseases of the head" *Scabs on the mouth* side by side with *Sturdy*, and *Louping ill*: in this way mingling affections of the skin with diseases of totally different organs—the brain and spinal marrow—and causing much embarrassment to the reader. To obviate this inconvenience, as well as to render the remembrance of the remedies an easy matter, I have adopted the above arrangement, in which each disease is placed opposite the textures it invades.

(122.) *Blown or Blast*. Can scarcely be reckoned a disease as it is but a symptom caused by a mechanical impediment to respiration and circulation. When a sheep has been brought from a poor pasture to a rich one it is prone to gorge itself to an extent which may endanger life. The lower end of the gullet becomes obstructed, the gases which accumulate in the paunch are hindered from escaping, and the latter becomes so enormously distended as speedily to suffocate the animal by being forced into the chest.

(123.) *Treatment* of Blown*. If the difficulty in

* In speaking of remedial measures, the word treatment ought to be used in preference to "cure" which figures at the head of the medical

breathing be only slight, keep the sheep moving *gently* up and down as the air will thus have a chance of *escaping* from the stomach. If the symptoms are more alarming, pass the elastic tube employed in the same complaint in cattle down the throat, or if that cannot be procured use a cane with an ivory or wooden bullet at the end of it. Never *stick* the animal, as recovery by this plan is almost hopeless. If you cannot obtain the aforesaid instruments, bleed the animal till it becomes very faint, and if this is of no avail proceed to kill it. Shepherds often prescribe a purgative dose after this occurrence. In general, however, it is not required. To prevent a flock becoming *blown*, always when, for the first time on rich pasture, make the dog move leisurely among them so as to prevent them feeding hastily.

(124.) *Braxy or Sickness.* Six or eight species of braxy are enumerated by shepherds, but as they all bear a striking resemblance one to another, in their origin and progress, it is preferable to treat of them as one disease. Indeed wire-drawn distinctions, though occasionally serviceable in cattle-medicine, ought in most instances to be avoided, as they are of but little avail, and in this disease straw-splitting can only serve to tantalize the farmer, by giving rise to ideas of finical modes of treatment, which before the Chapter ends are reduced to the simplest aids which medicine affords. Whatever may be the seat or seats of the disease, the

advice in veterinary works. It is sheer nonsense to blazon such a word in pages having any pretensions to candour, for how seldom are we able conscientiously to affirm that our endeavours will be followed by a *cure*. All we can do is to pursue the *treatment* best adapted for the attainment of so desirable an end.

identically same resources are employed in all :—why therefore ought the reader to be troubled with a hundred trifling phases, which, not being *essential* to the malady, can only tend to perplex him in his search for the little that is practically available.

(125.) *Symptoms of Braxy.* In those rare cases where the animal is seen at the commencement of the disease, it will appear uneasy, lying down and rising up repeatedly, loathing food, and drinking frequently. In a little while the symptoms become more decided, and fever shows itself. The wool is clapped, the skin hot, the pulse quick and strong, respiration is rapid and laborious, while the blood is thick and black, issuing from the orifice, in attempts at bleeding, drop by drop. Sometimes the heart beats irregularly : the mouth is parched, and the eyes are red, languid, partly closed, and watery. The head is down, the back drawn up, and the belly swollen ; there is scarcely any passage through the bowels, the urine is small in quantity, high coloured, and sometimes bloody. The sheep shuns the flock, slowly dragging itself to some retired spot, where convulsed and screaming it shortly dies. Death may occur in a few hours, or may, in some rare cases, be delayed for a week. A fatal termination is not so sudden as some have fancied, since the animal is in general seriously ill for many hours before it is discovered.

(126.) *Appearances on dissection.* Though many parts are commonly implicated in the *sickness*, there is every reason for believing the *reed* to be primarily affected. Inflammatory appearances, and mortification, the usual result of violent inflammation in this quarter, are visible on its coats, especially at the pyloric ex-

tremity (Plate I. Fig. 2, *py.*) The inner coat presents a blackish-red, and gelatinous appearance,—the entire bowel being soft, pulpy, and easily permeable to the finger. The intestines, kidneys, and bladder, will, in all probability, exhibit similar changes, while the lining membrane of the abdomen (the *peritoneum*) is frequently affected: when this membrane has been much inflamed, the intestines are glued together, are surrounded with bloody or flocculent serum, occasioning before death tumidity of the under part of the belly, and communicating, when struck, a feeling of fluctuation to a hand placed at a distance from the blow. The muscles in various parts of the body frequently participate in the disease, bloody serum being infiltrated between the layers. As the brain, in severe cases, exhibits symptoms of oppression, so on dissection it will be found red and turgid, enabling us to account for the convulsive movements during the termination of the malady. The whole body, more particularly the abdomen, gives out a fetid gangrenous odour, which has procured for braxy the pastoral appellation of “*stinking ill*” and renders the dissection far from pleasant. After death putrefaction goes on with great rapidity, especially in moist weather, hence the necessity of testing the solidity of the carcass by giving it, as is customary in some parts, *three shakes* before proceeding to prepare it for household use!

(128.) *Causes of Braxy.* Whatever tends to constipate the bowels may be reckoned a predisposing cause. Whenever constipation occurs, especially if on a sickrife pasture, the sheep may be looked upon as *ripe* for the disease. Any crude indigestible substance,

taken into the stomach when the animal is in this state, will have a tendency to kindle braxy, and the liability to it will not only be heightened, but the chances of recovery will also be lessened, by the animal being in high condition.

Wedder hogs are peculiarly its victims, but only when hirsled, as when allowed to pasture with their mothers they are less liable to it. This is accounted for by the fact, that hirsled hogs are comparatively *dull*, not being familiar with the proper times for feeding, and incapable of selecting the suitable herbage, from having wanted the tutoring of the mother.

From the beginning of November till the middle of March, *sickness* commits its greatest ravages, especially among heath sheep, from their being more confined than others to dry binding provender. Frozen grass is also a common exciting cause, rapidly inducing inflammation by lowering the temperature of the stomachs so very much as to arrest digestion, and lead to its acting as an irritant. The succulent grass in the sheltered hollows of mountains is more liable to frost than a sapless herbage, and to it, owing to its moisture, the young sheep resort, devouring it eagerly to assuage their thirst. Braxy, however, may arise from other and more obvious causes. The sheep, perhaps when heated by rash dogging, is suddenly chilled by exposure to a shower, or a plunge in a morass, and if the bowels be at the time any way bound up, immediate mischief cannot but ensue. One of the rarest accidents to which it has been attributed is the prevention of the passage of the *fæces* by a knot, or intussusception, forming on the intestines, but this occurrence would be of difficult dia-

covery, and even if made known, our treatment, though not differing much from that of braxy, could hardly be successful.

(128.) *Treatment of Braxy.* Recovery is in many instances almost hopeless, owing to the length of time which in general elapses between the onset of the disease and the shepherd's discovery of the animal. Nevertheless, the best treatment ought in every instance to have a proper trial, as life may often be saved when such a result is least expected. Many plans have been resorted to, but none are found to suit so well as that of bleeding and purging. The first thing to be attempted is the procuring of a copious flow of blood, but, as before mentioned, this is a difficult matter, owing to the stagnant state of the circulation at the surface of the body. Its abstraction may, however, be rendered easy, by placing the sheep in a tub of warm water, or, where this cannot be procured, by rolling a blanket wrung out of hot water round the body of the animal. The tub of water should always be preferred, and the moment the sheep is placed in it, the tail should be nicked, and one or both jugular veins opened.

Retain the sheep in the bath for half an hour, adding hot water from time to time, so as to sustain the original temperature. This of itself will alleviate the sufferings of the animal.

When a copious flow of blood has been obtained, remove the sheep from the tub, and administer two ounces of Glauber's or Epsom salt, dissolved in warm water, substituting a handful of common salt when these cathartics cannot be procured. It is needless to give a *purgative* without bleeding, as, till this is done, it will

not operate. When in spite of this the bowels continue obstinately constipated, give a glyster of tobacco decoction, made by boiling a drachm of the leaf (the full of a pipe will do) for a few minutes in a pint of water. Half of this only should be injected, using the other if circumstances require it. Place the sheep in a house, or any comfortable situation, bed it with straw, throw a horse-rug over it, and promote the purging by warm gruels. When out of danger supply it with moderate quantities of laxative provender, and keep it for ten days apart from its fellows, by which time it will, in all likelihood, be well recruited.

(129.) *Prevention of Braxy.* Change of pasture will at once suggest itself. Let it be to a succulent one, on which old sheep have been for some time feeding; the hogs will thus be hindered from filling their paunches too rapidly. But, if heathy food is the staple provender, allow your sheep four or five hours of turnips in the twenty-four, permitting at the same time free access to common salt. These, from their laxative effects, will serve as antidotes to the dry sapless grasses, which have led to the disease. Such places as mossy soils, abounding in evergreen plants, will also serve the purpose. Burn your ley heather, as nothing is more decidedly prejudicial, not only from its constipating qualities, but also from being surrounded by a grass, which is so much relished by the sheep, that they resort to the spot long after it has been eaten to the quick, and devour in their eagerness much that is foul and unwholesome from frequent puddling. You thus obtain a good supply of sprouts, as invaluable for opening qualities, as the old heather is to be dreaded for its astringency.

Finally, be aware that careful herding is not the least efficacious of preventives ; a quiet, even-tempered, and thoughtful shepherd, being here of far more value than the stores of the apothecary.

(130.) *Pining. Symptoms and Causes.* The name has arisen from the rapid wasting, which is a prominent symptom in this complaint. A farm can hardly be subject to a more ruinous distemper, as the same sheep will be affected by it year after year, and if a ewe be attacked during autumn it is ten to one she will not have a lamb in the ensuing season. Pining only seizes on thriving sheep, preferring young ones, those more especially of the larger breeds, and is confined to farms where the land is principally micaceous and covered with occasional stripes of bent grasses. A whole flock sickens at once, their usual alacrity appears to have deserted them, their eyes are dull, and the whole animal seems weary and languid. At a more advanced stage the wool acquires a bluish tinge, the blood becomes thick, diminishing in quantity, and the muscles assume a pale and bloodless appearance. The bowels are constipated, and to this the feverish symptoms apparently owe their origin. If the disease progress, death will ensue in about a month.*

(131.) *Treatment and Prevention.* The first object is to obtain a free discharge from the bowels by means of purgatives, as, whenever a flux appears, the animal is

* A gradual wasting of the animal, similar to what occurs in pining, may result from the irritation consequent on swallowing pointed bodies, as pins or needles. I have in my possession a very stout needle, given me by Mr Wilkin of Tinwald Downs, which was found buried in the coats of the stomach of a young sheep which died under the above symptoms, having been ill about three months.

safe. Two ounces of Castor oil given in a gruel, or the same quantity of Epsom salts, will do, care being taken that the purging be carried to some length.

Removal to a rich pasture is the only preventive. That pasture should be preferred which contains a good proportion of bitter plants, for the emaciation appears to be owing in a considerable degree to torpor of the bowels occasioned by long abstinence from these necessities.

(132.) *Staggers*. The symptoms nearly resemble those of sturdy, which I have afterwards to describe, and with which indeed I might have classed it, were it not that it appears to be merely the result of a poisonous plant being taken into the stomach. It is rarely seen hereabouts; I shall, therefore, quote the account of it presented to the Highland Society by Mr Stevenson:—"This is a disease seldom or never affecting the sheep in this country, those excepted which feed in forests, or amongst planting. The symptoms of it are more violent than those of sturdy, during the time of their continuance. The animal, after staggering for some time, falls on the ground, when a general trembling comes on over the limbs; they are violently convulsed, and quite insensible to every thing. During the continuance of the paroxysm they throw the body into various positions, and sometimes roll to a considerable distance. The fit continues for a quarter, sometimes half an hour, or an hour. When they rise, they seem perfectly bewildered, till they regain the flock, when they continue to feed well, till another paroxysm supervenes. This disease appears in Autumn, and various causes are said to produce it. Improper

food, the leaves of the oak, from their astringent quality, cobwebs sprinkled with dew, have all been reckoned as causes. I am inclined, however, to suppose, that it arises from the action of a poisonous grass (*Lolium temulentum*), which is the only one of that description in this country, and grows only in those situations where staggers prevail. What effect these causes have on the brain to produce this disease, I cannot explain. When it continues for any time on the same individual, it is apt to be fatal."

"Change of pasture is the only effectual cure for it."

(133.) *Diarrhæa*. By this is meant a constant purging, affecting the younger portions of the flock between April and June, leading to great emaciation, and proceeding from one of the following causes.

1st. Eating a soft tathy pasture, particularly if fouled by the inundations of the previous winter.

2d. Feeding on too rich a pasture, or a sudden change from an herbage deficient in nutritive qualities, to one that is much superior.

3d. Transitions from heat to cold.

4th. Weakness and relaxation of the bowels.

(134.) *Treatment of Diarrhæa*. When either of the first two causes has given rise to purging, a moderate allowance of good hay will gradually stop it. This may be discontinued when the sheep has *taken* with its altered fare.

When diarrhœa has been occasioned by exposure to damp, or sudden transitions from heat to cold, it may be arrested by keeping the animal in a house for a few days, and feeding it on any dry aliment, but when *crude trashy matter* has been swallowed, and keeps up

irritation by its presence, medicine must be resorted to. Administer an ounce of castor oil in gruel, adding twenty drops of Laudanum if there has been straining or evidences of pain. When the bowels have been *thoroughly cleared* by this cathartic, it will be proper, if the discharge still continue, to check it by astringents. The medicine found by experience to answer best, is prepared as follows :—

Take of Logwood four ounces,
Extract of Catechu (Japan earth) one drachm,
Cinnamon two drachms,
Water three English pints.

Boil for a quarter of an hour, strain, and then add sixty drops of Laudanum. Administer half an English pint of this night and morning so long as the flux continues.

Diarrhœa seldom proves fatal, and is indeed an easily managed disease ; but as it is frequently only a symptom of some other affection, or a critical effort of the constitution to ward off some more serious mischief, the attempts at stopping it should always be cautiously conducted.

(135.) *Dysentery.—Symptoms.* The pulse is quick and the respirations hurried. The skin is harsh and hot, and the wool in general clapped. The mouth is dry, the eyes red and languid, and the ears drooping. Food is taken only in small quantities and rumination is stopped. The discharges from the bowels are frequent, slimy, sometimes green, and a little further on in the disease are mixed with blood. The belly is drawn towards the back. It is knotted and lumpy to the touch and a rumbling noise (*borborygmus*) is heard within it. As a careless observer might have some difficulty in

distinguishing dysentery from diarrhœa the following diagnostic summary, drawn up by Professor Duncan, will be found of service.

1. Diarrhœa attacks chiefly hogs and weak gimmers and dinmonts ; whereas dysentery is frequent among older sheep.

2. Diarrhœa almost always occurs in the spring, and ceases about June, when dysentery only commences.

3. In diarrhœa there is no fever or tenesmus, or pain before the stools, as in dysentery.

4. In diarrhœa the fæces are loose, but in other respects natural, without any blood or slime ; whereas in dysentery, the fæces consists of hard lumps passed occasionally without any blood or slime.

5. There is not that degree of fœtor in the fæces in diarrhœa which takes place in dysentery.

6. In dysentery, the appetite is totally gone, in diarrhœa it is rather sharper than usual.

7. In dysentery, the animal wastes rapidly, but by diarrhœa only a temporary stop is put to its thriving, after which it makes rapid advances to strength vigour and proportion.

If dysentery continue to advance it will terminate fatally within a fortnight. Death is generally preceded by the "*black scour*," which is only an aggravation of the purging, the stools being mixed with shreds of dark gangrenous matter from the decomposed interior of the intestines.

(136.) *Causes of Dysentery.* Many absurd opinions have gone abroad regarding the contagious nature of this affection. Contagion, however, has nothing to do with the matter, the spread of the disease depending

entirely on the state of the atmosphere and the nature of the locality. When dysentery occurs the weather is usually sultry, the ground upon which the flock has been going, foul, and the management of the sheep so improper, as to be sufficient of itself to produce the disease very generally. There is in fact only one proof of a disease being infectious, viz., its immediate occurrence on the introduction of an affected animal among such as are in good health, on sound food, and in easy circumstances. This proof, however, in regard to dysentery has never been established, and no medical person will now affirm that it is contagious. Some think that it travels from flock to flock in the direction of the wind, but its appearing simultaneously in many folds ought rather to be charged to the fact of the predisposing causes being nearly similar in all.

(137.) *Treatment of Dysentery.* Bleed freely if the disease has continued only for a few days, but moderately if a longer time has unfortunately elapsed. Stoving, by which is meant shutting the animal in a wash-house, and allowing the apartment to become filled with steam, though urged by some writers, cannot here be recommended. The intended object is the promotion of perspiration, by exciting the action of the skin, but this may be brought about by means much more conducive to the safety of the animal. After the bleeding immerse the sheep in a tub of hot water, and retain it there for twenty minutes ; then administer an ounce of Castor oil, with thirty drops of Laudanum, and cover the sheep up in a snug corner. After the oil has operated, thin well-boiled flour-porridge, given at intervals, in small quantities, will help to defend the

ulcerated bowels, sooth the pain, and stop the purging. If these fail, you may use the astringent mixture recommended in diarrhœa at page 175, and in the same manner, adding to each dose a grain of ipecacuanha. When the appetite returns, and the stools begin to acquire consistency, speedy recovery may be prognosticated.

During recovery part of the wool always falls off.

(138.) *Prevention of Dysentery.* If you wish your sheep to take the disease, do as some wiseacres recommend—put tar upon their tails, and noses; you will thus render them feverish, and uncomfortable, and every way fit for an attack.

Gathering sheep into confined places is always bad, nothing will tend more to ward off dysentery than an open frequently-changed easy-lying pasture, combined with gentle usage on the part of the shepherd.

DISEASES OF THE SKIN.

(139.) *Scab, or Itch.*—*Symptoms and Causes.* These are so well known that they hardly merit a description. Little white specks appear upon the wool, and are soon followed by a small pustule at the root. The pustules are produced by a minute insect burrowing in the skin, which accounts for one external application of any active substance being sufficient to eradicate the malady. The infected sheep is restless, tearing off the wool with its teeth, and rubbing itself against every resisting body. The skin is red and fretted, discharging an ichor which hardens into crusts. These gradually extend, inducing a premature failure of the wool.

If the sheep be not relieved, it sinks under its accumulated miseries.

Scab was little known any where, but in the Highlands, and the south of England, till the good old custom of smearing with tar and butter gave way before the elegant modern innovations. Into flocks anointed in the old manner it may be carried by infection, but will seldom or never arise spontaneously among them.

It usually commences in spring among hogs, making its first appearance among the rams, especially those of the fine-woolled breeds, and is supposed to be induced by overheating, want, or even excess of nutriment, or pasturing on wet lands in rainy seasons.

(140.) *Treatment of Itch.* Subject the flock to a minute examination whenever the movements of any animal excite suspicion, and remove every one that is in the least affected. Place them in a separate enclosure, and apply either of the following recipes.

Take of Mercurial Ointment four pounds,
Venice Turpentine half a pound,
Oil of Turpentine one pint :
mix thoroughly.

Separate the wool from the head to the tail and draw the fore finger loaded with a portion of the ointment, along the bottom of the groove. Then make lines from the middle of the back down each leg and score them in the same manner, thus concluding the operation. Some farmers prefer rubbing the size of a walnut of the ointment into the delicate skin inside the thigh. The former plan is, however, the better of the two, and is the one recommended by Sir Joseph Banks, who communicated the recipe to the Society for the Encouragement of Arts, Manufactures, and Commerce, in the 7th volume of whose transactions it was published.

A most important benefit to be derived from the ap-

plication of the mercurial ointment, is the security it affords the sheep from the attack of the sheep fag or ked (*Hippobosca ovina*). The wool of sheep annoyed by this fly always contains joints or knots, owing to the occasional stoppage of its growth consequent on the fretting of the irritated animal. On this account dealers in wool are said to give a higher price for fleeces having the mercurial tinge, as they are supposed to be sound in the pile from having been exempted from the fly.

The next prescription is one of very great efficacy where the disease has reached the length of scabs, and has, with many variations, gone the round of almost every agricultural publication. The form I prefer is one submitted to me by Mr Wilkin of Tinwald Downs, near Dumfries, who at one time, several years ago, applied it with immediate good effects, to six hundred infected sheep.

Take of Tobacco scrapings one pound,

Strong decoction of Broom six gallons ;

boil for half an hour, and then add three English pints of spirit of tar.

This quantity is sufficient to cover two dozen of sheep. The scabs, if large, should be raised a little with a knife to permit the free contact of the fluid, and no more of it should be applied than is here directed; for though it be in this dose comparatively harmless, a very small addition will destroy the animal.

A very good French remedy is made by melting a pound of fat or suet, and mixing with it (when off the fire) a fourth part of oil of turpentine. Rub it into the affected parts.

Whatever outward means may be employed, laxative

medicines ought never to be neglected. One of the best and most generally used, consists of a tea-spoonful of flour of sulphur, given for two or three successive nights in double the quantity of molasses.

If ill-conditioned sheep are the victims of itch, convey them to a better pasture, but where the animals are fat, reduce their diet, and give each a dose of Epsom salts.

(141.) *Prevention of Itch.* Do not turn a healthy flock on to pasture, from which itchy sheep have recently been driven. If the disease occasionally break out on your ground, apply the mercurial ointment at clipping time; and, when you salve, add a pound of sulphur to every tub of smearing composition whatever it may be.

(142.) *Erysipelas or wild-fire.* This is an inflammatory affection of the skin, sometimes accompanied by blebs or blisters, occurring in August and September, and spreading rapidly through a flock. Though there is considerable ambiguity in the employment of these terms, I believe they are synonymous with red-water, the disease of which I have next to treat.

(143.) *Red-water.* The occurrence of this disease among sheep is very rare. Its nature and treatment are however allowed, by those who have seen it, to be admirably described by Mr Stevenson, in the 3d vol. of the *Highland Society's Transactions*.

"This disease commonly makes its appearance about the beginning, or end of winter, and first affects about the breast and belly, although at times it spreads itself over other parts of the body. It consists in an inflammation of the skin, that raises it into blisters which contain a thin, reddish, and watery fluid. These

continue for a short time, break, discharge their matter, and are followed by a blackish scab. When the sheep are exposed to cold or wetness, the skin being fretted makes the blisters rise, or they often arise from cold, affecting the animal internally, thus producing a slight fever, which throws out these vesicles on the body, similar to the scabby eruptions, which appear about the face, and more particularly the mouth of those persons affected with cold. The blood in this disease is but little affected, though a little of it oozes into the vesicles on the skin, and communicates to them that reddish tinge, which gives origin to the name.

“Redwater is a disease that but seldom appears in this country, and is almost never fatal. In cases where the disease is violent, a little blood should be taken. * * * * The sheep should be placed in a fold by itself, * * * * and the following medicine may be given for three or four mornings successively :—

Take of Flour of Sulphur two ounces,
Molasses three ounces :

mix them, and divide them into six doses, of which one may be given every morning, in half a pound (half a mutchkin) of warm water. If this is found unsuccessful, half an ounce of nitre, mixed with the foregoing recipe, will be attended with good effects ; after which, a dose of salts may be given, and the body washed with lime-water upon the part affected.”

(144.) *Leg Evil.—Symptoms and Causes.* Like many other diseases, this is usually supposed to be contagious, merely because it often spreads quickly through a flock ; the obvious fact of the exposure of the animals composing it to the same causes, such as peculiar diet,

and atmospheric variations, being entirely overlooked; but, as I have already remarked in paragraph (136), the only proof of a disease being contagious, is its spreading rapidly on the introduction, from a distance, of an infected individual into a previously-healthy flock.

Sheep which acquire fat at an early age, are peculiarly liable to this disease: a sufficient argument, if all others were wanting, against the unnatural and foolish practice of accumulating a load of grease on the bodies of young animals. By so doing, the action of the heart and lungs is materially embarrassed, and, on the animal being chilled, or the balance of its circulation otherwise accidentally deranged, mortification (leg evil) is almost certain to occur. Even simple scratches are often fatal in these over-fat animals, from inducing gangrene.

The first intimation the shepherd has of the approach of leg evil, is the occurrence of fever and lameness, accompanied by blue or livid patches on the leg, generally about the upper part of the hoof or knee. The skin on the affected parts, in a few days, exhibits scattered vesicles, not unlike the blebs which form in erysipelas; it then gives way, and the parts beneath are seen of a darker tinge, soft, pulpy, and completely gangrenous.

Leg evil may prove fatal in a few days, or not for several weeks, much depending on the extent of the sloughing portions, which may include the entire leg, or legs, or may be limited to a single patch.

(145.) *Treatment of Leg Evil.* When the animal is in high condition, and the disease has arisen spontaneously, bleeding is the first thing to be thought of. It must, however, be conducted cautiously, it being

better to use the lancet a second time, than, by withdrawing too much blood, to reduce the vital powers below the standard which is necessary for replacing the gangrenous portions. Should a leg be affected to any extent, the sheep must be at once destroyed, as there is scarcely a possibility of its surviving, without a degree of care and nicety in the treatment, which it is beyond the power of unprofessional persons to bestow. Where the livid spots are limited, rags dipped in spirit of turpentine, which has been heated by immersing the bottle containing it in hot water, may be laid upon the skin ; but when dead portions have begun to separate, the best application is either a warm poultice, made of carrots, which have been boiled and mashed, or one made of boiled oatmeal, which has been fermented by adding to it a tablespoonful of yeast, and placing it for an hour before a fire. When the sore is becoming clean, and the granulations are rising freely, pursue the methods recommended in paragraph (110).

(146.) *Prevention of Leg Evil.* Remove the diseased animals from the flock, and, in dressing their sores, never use a sponge, or any thing which, from its value, is apt to be preserved, and, perhaps, applied in no long time to the cuts or scratches of a healthy animal ; for, though leg evil is not communicable by ordinary means, yet is it readily excited by inoculation, or the application of putrid matter to a broken surface. If the odour from the affected parts is any way offensive, wash them with, and sprinkle round the fold, either a weak solution of *chloride of lime*, or the *disinfecting liquid* of Labarraque, articles which may now

be procured from every provincial apothecary. Finally, let the shepherd *wash his hands carefully* before going from diseased to healthy sheep, using, if need be, a little of either of these solutions ; and let him look well to any injuries which his charges may receive in July, August, and September, for these are the months most favourable to the occurrence of leg evil.

(147). *Inflammation caused by Maggots.* The insects passing under the name of "Fly," though most troublesome in August, attack the sheep from the month of May to September, inclusive, depositing their eggs among the wool, in general about the tail, the roots of the horns, or any part which affords, from its filthy appearance, a prospect of suitable provision for the maggot. When these eggs are hatched, a process which is, in sultry weather, almost instantaneous, the maggot erodes the skin, and speedily brings the adjacent parts into a fit condition for the reception of succeeding numbers of its species.

The backs of long-wooled sheep are, from their exposure, more liable to be selected by the flies, as a receptacle for their eggs, than the corresponding parts in such as are covered by a short thick fleece.

No sooner has the maggot begun its operations, than the sheep becomes uneasy and restless, rubbing itself on stones and trees, and endeavouring, by every means in its power to free itself from the annoyance. Teazed by the constant irritation, fever soon sets in, and, if the sheep be unrelieved by the shepherd's aid, death ensues in four-and-twenty hours.

It is only lately that attention has been paid to the history of the insect pests which originate the mischief,

so little damage do they appear to have occasioned in former periods. In a valuable paper, containing the result of observations made on this subject in the Highlands, and published in the second number of the *Quarterly Journal of Agriculture*, they are thus described :—

“ The fly which is the immediate cause of this disease, seems, as far as my observations could extend, to consist of four species, viz.—the *Musca Ceasar*, *Cadaverina*, *Vomitoria*, and *Carnaria*, of Linnæus. * * *

“ *M. Ceasar* is of a shining green colour.

“ *M. Cadaverina*, the thorax shining bluish, the abdomen green, like the *Ceasar*.

“ *M. Vomitoria*, thorax black, or dark-blue grey, abdomen dark glossy blue. This is the common *Blue-Bottle* or *Flesh-fly*.

“ *M. Carnaria*, grey; the thorax has three black longitudinal markings on the upper surface; the abdomen is chequered, in some positions shining whitish.

“ In all those instances in which I observed them, the green flies were the first to attack, and this is the common opinion among the shepherds. After a time, when the larvæ (maggots) commenced gnawing the flesh, the putrid stench, which was thereby occasioned, attracted numerous other species. The *Vomitoria* (*blue-bottle*) was very common, more numerous than both the former species, and perhaps contributed most to accelerate the death of the animal, after the others had commenced. The *Carnaria* was rare. I observed but few of them, and these seemed not concerned; which is the more remarkable, as in the fenny counties of England it is said to be most troublesome. All the

species of this genus resemble one another closely, both in appearance and mode of life. They are exceedingly voracious, feeding upon carcasses and filth of every description. In five days after being hatched they arrive at full growth, provided they have plenty of food; they then cease to eat, and seek to assume the pupa state, crawling under ground two or three inches. Here they remain about fourteen days, when the shell cracks, and the imago, or fly, appears. In this last state, they feed also on putrid juices, sucking them through their probosces."

The correctness of this description of their transformations I can attest, from having watched their habits during my anatomical pursuits in the summer months.

(148.) *Treatment of Fly-blown Sheep.* When the sheep is fly-blown, dislodge the maggots with a knife, and shake a little powdered white lead into the wound. Do not apply tar to the abraded surface, as, from its cauterizing effects, the wound will be enlarged, and a repetition of the visit speedily ensured. To ward off the onset of the flies, various substances noxious to them are rubbed or poured upon the wool. Tar, in small quantities, and of pungent quality, is by some daubed upon the ears, horns, and tail. Others prefer rubbing a little melted butter, thickened by flour of sulphur, along the sheep's back: this is an effectual preventive. Some, again, prefer dressing the sheep, when in low situations, with the following recipe, which I take the liberty of copying from Mr Mather's paper on the fly, in the *Quarterly Journal of Agriculture*, No. XXIV.

"Take of Arsenic, finely pounded, one pound
Potash twelve ounces,
Common yellow soap six ounces,
Rain or river water thirty gallons.

"Boil the ingredients together for fifteen minutes.

* * * * The liquid is in no degree injurious to wool. It cleans and dries the offensive perspiration of the sheep, and destroys the smell caused by the dew in the mornings, or by damp hot weather. In most situations, one dressing in July and another in August will suffice; but as the expense is trifling, and the process simple, it may be better to apply it more frequently, especially in low and damp situations." The liquid is applied only in dry weather. A teapot, or any vessel of a similar form, is filled with it, and one person pours it on the wool, while another rubs the fleece to facilitate the passage of the fluid. At the times of using the solution, all superfluous wool ought to be shorn from the buttocks, but not too closely.

When the insects are very troublesome, drive the sheep if possible to higher ground. Examine carefully all wounds and ulcers, however trifling, and dress them with any simple ointment containing a small proportion of sulphur, mercury, or white-lead. Lastly, bury all useless carcasses as speedily as possible, by which means you will keep down the number of the flies.

(149.) *The Sheep-Fly or Ked (Hippobosca ovina)* and *The Tick (Acarus reduvius)*, are destroyed or stopped in their attacks by the same remedies and preventives detailed in the preceding paragraphs on the fly.

(150.) *Inflammation produced by the Œstrus bovis.* This insect infests not only cattle but also sheep and

goats, depositing its eggs on the back of the animal, where it forms a small tumour, in which the larvæ remain from autumn till the commencement of the ensuing summer. Only the fattest and most vigorous animals are attacked, and the larvæ are very difficult to destroy. Fischer found, from numerous experiments, that even spirits, and a strong solution of salt, could not affect them. The fumes of burning sulphur alone seemed to annoy them, and to it they speedily fell victims. This, however, is a remedy which cannot be applied to the skin of the sheep, so that our only resource is the repeated application of turpentine to the tumours on the back, taking care to slit them up so as to facilitate its action.

(151.) *Sore Teats.* When a ewe is observed to hinder the lamb from sucking, its teats should be examined. If much inflamed, a poultice should be applied, and the lamb placed under the charge of another nurse. Suppuration will thus be promoted, and the matter may be allowed to escape by making an opening for it at the place it points. If there is only a little tenderness of the skin, all that is required is the washing it with a solution either of sugar of lead or sulphate of zinc, eight grains to the ounce of water.

(152.) *Foot-rot.* No disease occasions more acute suffering to the sheep, and annoyance to the farmer, than foot-rot, and no disease has led to longer arguments as to its contagious or non-contagious nature. Thanks, however, to Mr Dick of Edinburgh, these disputes are closed for ever, as any one may be convinced, by perusing his clever and sarcastic paper at page 852, Vol. ii. of the *Quarterly Journal of Agri-*

culture. His excellent remarks on the popular ideas of the infectious nature of foot-rot, I have not space to quote, but shall lay before the reader his views as to the situations and circumstances which give origin to the disease.*

(153.) *Causes of Foot-rot.* "What do we gain," says Mr Dick, "by enticing the sheep from his native and natural haunts to the richer pasturage of our meadows or lawns? There the animal enjoys a more luxuriant repast; it fattens to a larger size, and will, in this respect, repay the increased allowance which has been made to it. But instead of moving about in small troops, with the alacrity of the wild kinds, the sheep are seen in flocks of thousands, moving slowly over their pastures, and gorging themselves to an extent which cuts short the thread of life, by the advancement of various diseases. Instead of wandering from the summit of one peak to another, in quest of a scanty subsistence, or instead of being compelled to descend from the summits of the mountain in the morning, and ascend again in the evening, they are compelled, in many cases, to remain within a few yards of a particular spot for weeks together, and there engorge themselves to satiety.

"But what, it may be asked, has this to do with the foot-rot? More, I am inclined to think, than is generally imagined. The hoofs of the sheep being intended to receive a degree of friction from hard surfaces, are not acted upon when the animal is placed under such

* To enable the reader more easily to understand Mr Dick's views of this disease, I have added a drawing of the foot of the sheep, which it may be well to consult before entering on the subject.

Fig. 4. Plate. I. Section of a toe:—*c. c.* Crust of the hoof; *s.* Sole; *g. g.* Gland which secretes the hoof.

circumstances ; and the necessary consequence is an overgrowth of the hoof. The crust,—the part naturally intended to support the weight of the animal, and to endure the greatest share of fatigue,—is here allowed to grow out of all due bounds, because the softness of the pasturages, upon which it now moves, presents little, if any, of that rough friction to which the feet of the animal is naturally intended to be exposed. The crust, therefore, grows unrestrained, until it either laps over the sole, like the loose sole of an old shoe, and serves to retain and accumulate earth and filth, or is broken off in detached parts, in some cases exposing the quick, or opening new pores, into which the particles of earth or sand force their way, until reaching the quick, an inflammation is set up, which, in its progress, alters or destroys the whole foot."

* * * * *

" The finest and richest old pastures and lawns are particularly liable to this disease ; soft, marshy, and luxuriant meadows are equally so ; and it is also found in light, soft or sandy districts. In the first of these it is perhaps most prevalent in a moist season, and in the latter in a dry one ; in short, it exists to a greater or less extent in every situation which has a tendency to increase the growth of the hoofs without wearing them away, and more especially where they are kept soft by moisture. It is so prevalent in fine lawns and pleasure grounds, that they are, in many instances, reduced in value to a mere trifle as a pasture for sheep ; they are said to be *infected* with this disease, and having once become so, the vicissitudes of *seven* seasons are scarcely sufficient to destroy the contagion! A

luxuriant herbage, on soft pastures, is equally subject to it ; and, in both cases, the disease is increased in a wet season.

“ The reason why, in these situations, sheep are so liable to the disease, is quite obvious. They are generally brought from lands where their range of pasturage was greater than in these situations. In their former state, from the exercise which the animal took, and the nature of the grounds on which it pastured, the hoof was worn down as it grew ; but, under the state in question, the hoofs not only continue to grow, but, where the land is moist, that growth is greatly increased ; and the animal does not tread upon hard ground, nor has it exercise to wear them down. Now, in the case of man himself, when the nails of his fingers or toes exceed the proper length, they break, or give him such uneasiness as to induce him to pare them. And the same takes place with the hoof of sheep. But there is this difference in the case of the latter, that when their hoof once breaks, as the animal has not the power of paring it, the part thus broken must continue a wound. Some parts grow out of their natural and proper proportions ; the crust of the hoof (*c. c.*) grows too long ; and the overgrown parts either break off in irregular rents and unnatural forms, or, by over-shooting the sole (*s.*), allow small particles of sand or earth to enter into the pores of the hoof. These particles reach the quick, and set up an inflammation, which is followed by the destructive effects which are too well known to require description.

“ Similar effects are produced on soft, wet grounds. The feet, in such a situation, are not only not subject

to a proper degree of friction to wear down the hoofs, but the growth of the hoofs is materially increased by the soft and moist state in which they are kept. And this state renders the feet the more liable to the disease, as it opens up the pores of the horn, and allows the earth or sand to penetrate, and wound the quick, in the manner I have already stated. On soft sandy ground, of a dry nature, the same circumstances may occur. The soft sand gives way by the weight of the animal, and the crust of the hoof is not worn down. The sand penetrates between the sole and the crust, as has been already explained, and produces inflammation. The disease, however, is not so common on sand as in the other situations to which I have alluded, the sand seldom being found in such a loose state."

Another variety of foot-rot is produced by the friction of long grass between the hoofs, but is mostly confined to hill sheep, when first pastured on lowland districts. These animals, from having been accustomed to collect their food on extensive ranges of bare pasture, are more exposed than heavy breeds to this frequent exciting cause of the complaint. The rubbing of the grass frets the skin in the cleft of the hoof, the gland in that situation swells, becomes enlarged, and suppurates, and in no long time the animal is compelled to rest upon its knees.* This complaint is, however, more

* *Fig. 5. Plate. I.* Gives a view of the inner surface of the toe of a sheep, with the interdigital gland laid open.

g. The gland.

d. The duct of the gland, opening upon the anterior surface of the leg.

When the interdigital gland is much enlarged, it becomes necessary to cut it out. This ought to be a last resource, as the part appears to be of too much importance to be easily dispensed with.

readily remedied than the former, and does not cause nearly so much suffering to the sheep.

(154.) *Treatment and Prevention of Foot-rot.* As foot-rot, in nine cases out of ten, is an attempt on the part of nature to get rid of a portion of the hoof, which ought, in the proper course of things, to have been worn away as fast as it appeared, the prevention and treatment of the first stage of the complaint will naturally suggest themselves. "As this disease," says Mr Dick, at the conclusion of the aforementioned paper, "arises in consequence of the hoofs not being exposed to sufficient friction to wear them down, or keep them in their proper state, or where their natural growth is increased by the nature and moisture of the ground, the hoofs of all the flock should be regularly rasped or pared at short intervals, say from eight days to a fortnight, according to the rapidity with which a particular pasture produces the disease. In certain situations, they might be made to travel upon a hard surface, similar to natural sheep tracts, or be folded in a place purposely prepared, upon which they could move about and wear their hoofs. For that purpose, they should be placed in it every day."

When foot-rot has fairly commenced, pare the hoof from the affected part, and trim away any ragged portions, wash the foot with soap and water, and place the animal in a situation where as few irritating things as possible will be in the way of the tender surface, and give a purgative. If not properly attended to, the suppuration soon terminates in mortification. Cleanliness in every stage and variety of foot-rot, is of the first importance. Many corrosive preparations

are recommended for the cure of this disease, but I have decided objections to one and all of them. When the foot is clean, endeavour, by frequent applications of soap and water, to keep and treat the ulcers as directed in paragraph 110.

(155.) *Inflammation produced by Insects in the Air Passages.* Much annoyance is caused to the sheep by the presence of animals in the air passages. The *Æstrus ovis* deposits its eggs on the margin of the nostril in autumn ; these are soon hatched, and the larvæ immediately find their way up the interior of the nose, till they arrive at the frontal sinus, a cavity situated between the layers of the frontal bone, and of considerable size in the sheep. Here they remain till the following spring, when they quit their hold, become winged insects, and enter upon the career of torment so ably gone through by their predecessors.

The *Pentastoma*, an animal supposed at one time only to exist in the frontal sinus and lungs, and on the surface of the liver, of the dog, wolf, and horse, as well as in some reptiles, has been discovered by an able naturalist, my friend Mr Rhind of Edinburgh, in the frontal sinus of the sheep. It spends its whole existence there, and is distinguished from other entozoa by having the mouth between two pores on each side, through which a spicular process comes out. Figure 3, Plate VII. is taken from a drawing kindly furnished by Mr Rhind.

(156.) *Removal of Insects from the Nostril.* The *Æstrus ovis* occasions much distress to the sheep at the moment of depositing its eggs within the nostril. The animal, on feeling the movements of the fly, rubs its

nose against the ground, or, carrying it low, darts off at a rapid pace, vainly endeavouring to escape from its tormentor. During this period, a thin limpid fluid distils from the nostrils, leading a careless observer to confound the symptoms with those which accompany Coryza. In general the irritation is now terminated, as, while in the larvæ state, the insects are incapable of offensive measures. If they are clustered in considerable numbers in the frontal sinuses, they will doubtless lead to great suffering, parallel to what is recorded to have followed the nestling of insects in the same situation in the human being; and it is, therefore, advisable, when the cause of sturdy (paragraph 169) is in any way doubtful, first to apply those substances to the nostril, which are calculated to destroy both these larvæ and the *pentastoma*, should they happen to be there. Tobacco smoke is the only available remedy, and a very good one, being easily brought in contact with the worms, and, when properly administered, certain in its effects. One person secures the sheep holding the head in a convenient position, while another, having half filled a pipe with tobacco, and kindled it in the usual manner, places one or two folds of a handkerchief over the opening of the bowl, then passes the tube a good way up the nostril, applies his mouth to the covered bowl, and blows vigorously through the napkin. When this has continued for a few seconds, the pipe is withdrawn, and the operation repeated on the other nostril.

The round hair-worm (*strongylus filaria*) has been found in great numbers in the trachea and bronchii of *culves* by Camper, and of the sheep by Daubenton.

It has also been found in the reed and duodenum of the latter animal by Rudolphi. Two other species of the genus *Strongle*, the *S. contortus* and *S. filicollis*, have been detected in the sheep, the former in the belly, the latter in the small intestines. They all appear to originate only in such sheep as are exposed to the sapping influence of low damp situations, combined with stinted diet. Those occurring in the air tubes give rise to irritation, and a consequent harassing cough, which is only to be arrested by removing the sheep to a dry airy locality, and a nutritious pasture. Unless portions of the worms are thrown up during coughing, they cannot be pronounced with confidence to exist, as the symptoms which they produce are very similar to those which accompany the two following diseases.

(157.) *Coryza*. During the winter months, this affection is of very frequent occurrence among sheep; but health is only in a few instances seriously affected. It is brought on by the exposure of the animal to intense cold, or to sudden chills, after it has been heated. In slight cases, the only annoyance to which the sheep is subjected, is from matter accumulating in the nostril, and plugging up the orifice, so that the poor creature is compelled to raise its head every three or four minutes, and labour hard for breath.* When the inflammation extends further down the air tubes, the

* The sheep is more inconvenienced by *Coryza* than other animals, owing to the naturally small calibre of the nostrils, the inferior turbinated bone being of large dimensions, and occupying the greater part of the nasal cavity. It is from this peculiar formation of the nose, that sheep are so very easily blown, when made to exert themselves in running.

symptoms assume a severer type, and death soon occurs, in general from suffocation. If the inflammation of the bronchial tubes becomes chronic, that is to say, if it goes on in a mild form for a length of time, pulmonary consumption (rot) will in all probability succeed, and destroy the sheep in a more lingering manner.

(158.) *Treatment of Coryza.* Should this disease prevail in a lenient form among your sheep, removal to a sheltered field, and a dose of purgative medicine, are all that is required. If, however, the feverish symptoms are severe, besides giving a purgative, bleed at the outset of the disease, and administer ten grains of the following fever powder, dissolved in a tea-cupful of warm water :—

Take of powdered Digitalis (Foxglove) half a drachm.

Tartarized Antimony fifteen grains.

Nitre two drachms.

Rub them well together, and divide the mixture into fifteen parts or powders. Half an hour after the powder is swallowed, give the sheep a basin of warm gruel, and repeat the powder at the end of six hours, if the symptoms are not considerably abated. When the sheep is recovering, keep it on juicy food, and do not expose it to inclement weather, as it will be very liable to another and more severe attack. Those sheep which are subject to cough on slight changes of temperature, should always be picked out, fattened for the market, and disposed of at the earliest opportunity, as they will, in all probability, sooner or later, fall victims to the following disease.

(159.) *Rot.* Every animal, from the serpent up to

man, that is to say, every animal possessed of lungs, is liable to *rot*. The inelegance of the term might be overlooked, provided a precise meaning were attached to it. Every one, however, seems to place some peculiar signification, and to hang some favourite theory, upon it, so that little wonder need be expressed either at the varying tenor of the treatment, or at the unsatisfactory conclusions which have been drawn regarding it. The word "*rot*," when employed in speaking of man, implies what, in popular language, is called "*consumption*," and is applied to that disease only when it affects the lungs. Thus the fork-grinders of Sheffield, who, from the nature of their employment, are much exposed to the exciting causes of consumption, and who, at an early age, fall victims to it, are said, by the people of that town, to die of rot. The term, however, so far as it has yet been used in relation to the sheep, has figured as the representative of a host of diseases, and, in becoming standard from frequent usage, has only rendered confusion worse confounded. "*Rot*," says the late Professor Coventry, in his *Introductory Discourses*, "is a word which has been employed to express a variety of disorders affecting this animal, with no small confusion and detriment. Indeed, in few instances has senseless indiscrimination done more mischief; for means inapt and injurious have been had recourse to, where skilful and timely interference would have had the happiest effects. Sheep are sometimes said to have the rot, when they labour under *phthisis pulmonalis* (consumption of the lungs), which they do but rarely; or under disorders of the liver, as *hepatitis chronica*, and that state of the same organ produced,

or attended by the *fasciolæ hepaticæ* (flake worms), *hydatides*, &c., which affections of the liver are not unfrequent. But the most common rot is still another and very distinct disorder, resembling, in many points, and probably the very same in its nature with, *scorbutus* (scurvy) in the human species, or that *miseranda lues*, that direful ruin of the general health and constitution, which silently supervenes from deficient or depraved aliment; and from which, as numerous observations testify, every flock, every sufferer, may be recovered by simple means seasonably used; but against which, in its advanced stage, all remedies prove of no avail. Perhaps, as the last symptoms of debility are very similar, and are most taken notice of by ordinary observers, the different kinds of rot might conveniently enough pass under the names of pulmonic, hepatic, and general rot."

Setting aside, for the moment, the inaccuracy of part of the above observations, I shall only remark, that, though Dr Coventry, in thus calling attention to the conflicting state of opinions on the subject, has accomplished much in reconciling discrepancies, he has still left something to be done in simplifying the matter; while he has, at the same time, rendered that something difficult of execution, from his own high authority being associated with the blunder. The only way, therefore, to remedy the thing, is to quit for the present the views of that learned gentleman, while I endeavour to give a plain account of the disease, its causes, and effects.

(160.) *Symptoms of Rot.* The first thing which indicates the presence of the disease, is the unwillingness of the affected animal to move about. It lags

behind the flock, ascends a slope with difficulty, and has a listless, heavy, pithless appearance. Cough, varying in frequency and violence, but extremely harassing, is present at every period of the disease, and is always increased on the slightest exertion.* At first this is accompanied by expectoration of the mucus of the air tubes ; but in no long time purulent matter, indicative of more extensive inroads on the constitution, begins to be coughed up, and goes on increasing in quantity and becoming worse in quality till the termination of the disease. The wool becomes fine, white, thin, and brittle in the pile, and is easily brought away in masses by the slightest pull. The appetite is, throughout the disease, voracious, and though all the bad symptoms may be present, still the animal keeps up an appearance of plumpness. This, however, is hollow and deceitful, and the rapid loss of flesh which immediately succeeds, shows with what insidious certainty the malady has been progressing. Owing to the falling off in flesh and in fat, the neck appears to have acquired additional length, and the eyes to have sunk within the head. Sooner or later the skin beneath the neck becomes distended with serous fluid, and from this the disease has acquired the name of *Poke*. The word, however, is far from applicable, as it might, with equal propriety, stand for any other disease attended with dropsical accumulations. Violent purging soon terminates the disease, death being generally preceded by the evacuation of a quantity of blackish matter.

(161.) *Appearances on Dissection.* The first thing

* It is quite possible that a sheep may die of true pulmonary consumption and yet have scarcely any cough.

which strikes a person on viewing the carcass of a sheep which has died of rot, is its leanness. In conducting the examination, the fell appears of a bluish white, the muscles are pale and wasted, and fat hardly to be met with. Where it once existed, a tough yellow substance alone remains, which is so destitute of all pretensions to the name of suet, that it cannot, even when thrown upon a fire, be made to blaze. Dropsical accumulations are found in the legs, chest, neck, and belly. On opening the chest, the lungs are often seen adhering at intervals to the lining membrane of the ribs, and have always a shrunk, diminutive appearance. These adhesions are frequently seen where there are no tubercles, and are in that case simply the result of exposure to cold ; but where they are coincident with tubercles, they may be ascribed either to the animal having been exposed to cold, or to the inflammatory action set up by the tubercles themselves. The lungs are always the principal, and I may also, from my own experience, add, the primary seat of the affection. When examined in the early stage of rot, they have a hard lumpy feel, especially at the upper part or lobe, and at this time a great number of irregular yellowish-white, patchy-looking bodies (*Plate VI. fig. 2.*), will be seen shining through the membrane, *pleura*, which surrounds the organ. These *tubercles*, as the hard white bodies are called, vary in size from that of a mustard seed to that of a pea. They are sprinkled through all parts of the lung, and will in every dissection, be found in a variety of stages, from the firm condition in which they were deposited, to the softened *state* which denotes their speedy expectoration. Each

tubercle, however small, usually holds a particle of calcareous matter in its centre. The lungs, in the advanced stage of rot, will be full of cells or caverns, owing to the destruction of its texture by suppuration in those parts where tubercles existed. The cells or sacs are of all sizes, from that of a bean to that of a goose egg; but if the animal has been taken care of during the progress of the complaint, and lingered long, the abscesses will be so numerous, and so closely situated, as to give the remains of the lung the appearance of a large bag. Extreme cases of this nature are, however, rare; as the sheep, in general, either falls before the knife, or is killed from exposure to cold long ere the disease has reached its farthest limit. These sacs contain purulent matter, of all shades and odours, and identical with that which the animal coughed up.

Tubercles, and all their concomitants as above detailed, are also met with in the liver, though not so frequently as in the lungs. They constantly occur in the *chyars* (mesenteric or lacteal glands) which on this account are much above their usual size, and are occasionally found in other parts; but I need not proceed in their description, as sufficient has been said about them to enable the unprofessional reader to understand their relation to the complaints.

Fluke worms and hydatids are almost constant attendants on rot, and seemingly most important ones, especially the former, which have, I may say, kept a great bulk of the learned and unlearned for many years in a perpetual bustle, and have so effectually hoodwinked writers on this subject, as to prevent them see-

ing the truly important points in the disease. For this reason, I hold them worthy of particular description; as it is only by becoming acquainted with their history and habits that we can form correct ideas either of their mode of origin or of their supposed ability to cause rot.

(162.) *The Liver Fluke (fasciola hepatica or distoma hepaticum, Fig. 6. Plate I.)* derives its name from the resemblance it bears to the plaice or flounder, though its shape has been more aptly compared to that of a melon seed. It is flat and oval, of a brownish-yellow colour, and varies in size from that of a pin-head to one inch in length, and half an inch in breadth. Each worm is bisexual or hermaphrodite, on which account they multiply with great rapidity. The generic name—*distoma*—signifies having two pores, *a. b.* *Fig. 6, Plate I.*, and is for this reason applied to it. The nipple-like body at the extremity *a.* contains the orifice of the pore or opening leading to the female division of the generative apparatus, situated between *a.* and *b.* In this cavity are formed the eggs, which are at intervals protruded, to be hatched when floating in the sheep's bile. The male organ is situated in front of the ventral pore. The anterior opening *b.* is equivalent to a mouth, and leads inwards and backwards, communicating with the intestinal canals *c.*, which are easily made out in the recent animal, from their containing dark bile, and which, as in other creatures low in the scale of being, serve the double purpose of a digestive and circulatory apparatus; that is to say, the stomach first prepares a fluid which is equi-

valent to blood, and then distributes it throughout the body.*

Flukes are never found in the *arteries* of the liver, as has been erroneously stated by some writers, their abode being limited to the gall bladder and its ducts. In these they are often present in such numbers as to cause great distention of the sac and tubes, and in some instances the irritation produced by them leads to the thickening of the walls of the gall bladder, and to a deposition of calcareous matter between its coats; frequently also to complete obliteration of portions of the ducts. Hence the crackling sound sometimes perceived when handling the liver of a rotten sheep.

(163.) *The Hydatid or Blob (Cysticercus tumicollis, Fig. 1. Plate VII.)* so frequently found in sheep, is in form one of the simplest of the entozoa (literally dwellers within), being little more than a bag containing a quantity of fluid. As relates to outline, this hydatid bears no small resemblance to a Florence flask. It is said to have a head, *h.*—a neck, *n.*—a body, *b.*—and a posterior or candal vesicle, *c. v.* Its claims to the title of an animal have been much disputed, but as it has been seen to move spontaneously, and as the contained fluid is always essentially different from that by which the hydatid is surrounded, the question may be looked upon as set at rest.†

* The examination of fluke worms is much facilitated by placing several of various sizes flat upon a slip of glass, and allowing them to dry in this position. On holding the glass between a bright light and a lens, and looking through the latter, the distribution of the vessels, and the position and form of the eggs, are beautifully displayed.

† The property of acting on organized matter, so as to convert it into substances similar to those which constitute the agent, is characteristic of a vital power.

The method of their reproduction is in unison with their structure, simple in the extreme. Nothing, however, very precise is known about the process. The vesicle which acts as heart and stomach serves also as the reproductive cavity, but how or by what means it is fecundated would be difficult to determine. The young hydatids are found adhering to the inner surface of the parent cavity. When they have attained maturity, the parent dies and shrivels, and the young ones begin to eliminate their nourishment from the juices of the quadruped which they infest.

These entozoa are found in general on the surface of the intestines, between them and their outer membrane (*peritoneum*), and on the exterior of the lungs and liver. They are always included in a cyst, to the inner surface of which they adhere by means of two hook-shaped processes projecting from the head. These cysts are always on the surface of the different viscera of the sheep, and in this way may be distinguished from another sacular animal, or rather supposed animal, termed acephalocyst or headless bag, which is sometimes found in clusters in the substance of the lungs, liver, &c. and is often confounded with the true hydatid.

(164.) *Causes of Rot.* If any one had been asked, thirty years ago, the cause or rather causes of the appearances which pass under the name of rot, he could not have enumerated them even in a day, for at that time each symptom was a disease, and as such was reckoned worthy of a separate and proximate cause. Nor could any person have had the courage to promulgate a common-sense opinion on the subject; for simple views regarding the diseases of domestic animals were

then either not deemed worthy of a moment's notice, or, if considered, were swept at once, by the strong current of prejudice, into the foul ocean of predetermined disapproval. Opinions in cattle medicine were at that time valued according to the prolixity of their detail; and the more improbable the dependence of the effects upon the cause assigned, so much more was its discoverer lauded, and in like proportion was the chimerical fabric he had raised admired. Times are, however, now happily changed; that potent oculist, the march of intellect, has cleared the film from the public eye, and no one need, at present, be afraid to state the unaspiring fact, that *tubercles* are the sole and proximate cause of the disease called rot.

The observations of the late Dr Coventry, already quoted, would lead us to suppose that tubercles are of rare occurrence in the lungs of sheep, but in refutation of this assertion, I need only request the reader to take a ramble through a butcher-market, and he will perceive, even on cursory inspection, the fallacy of this conclusion. What the state of the liver is which is attended with flukes and hydatids, he has left us to make out. Chronic hepatitis, which accompanies tubercles in the liver, goes for nothing as a disease of sheep, and therefore does not require a notice; besides, it is not rot, and is quite incompetent of itself to cause it. As for the scurvy of which he speaks, he evidently means the disease now generally known by the name of *Pining*, but which, as it has no connexion with rot, and has only become prevalent within the last sixteen years, could not be very well known to him.

The following questions will naturally occur to many of my readers. What gives rise to these tubercles? what are the predisposing causes which lead to their formation? and, when formed, how do these apparently unirritating bodies produce effects so baneful? Queries like these, however, cannot shortly be replied to, leading, as they do, to discussions which embrace many curious theories; but as the negative mode of teaching is often of avail where the positive or more direct would fail to bring conviction, I shall, before proceeding to allude to what the causes are, endeavour to state what they are not.

Imaginary Causes of Rot. The liver-fluke has long been looked upon as the origin of rot, and this opinion has now become so deeply rooted, and taken so fast a hold of the public mind, that if I were to contradict it by plain assertion, I should only be striving to buffet singly a tide of opposition. The best way, therefore, will be to examine a few of the theories supposed to be confirmatory of the notion that fluke worms are the beginning of the mischief, and then see whether their supporters have managed to make good the point.

I. The fluke is supposed to get into the liver of the sheep by being swallowed, and this, according to our theorists, may be brought about in some of the following ways:—

1. The eggs may be floating in the air, and thus accidentally reach their destination. This is the view taken by the celebrated Clater; but if he had been, in this instance, a man of experiment, rather than of idle conjecture, he would have found, as any one readily

may, that the eggs of the fluke worm sink in water, and, consequently, that they cannot float in air.*

2. The Rev. Dr Singer, to whom Scotland at large, and Dumfries-shire in particular, is much indebted for numerous and valuable papers on agricultural subjects, states, in the third volume of the *Highland Society's Transactions*, page 478, that "The spawn or eggs of the liver fluke are most probably conveyed upon the grass by summer watering, and afterwards taken into the stomach with it." A few lines further on, he speaks of the eggs being "wafted thither by harvest waterings." Now, as the fluke is only produced within the sheep, I need only put the unanswerable questions—How are they conveyed to the grass? and from whence are they wafted? to refute at once this hasty notion.

3. The eggs may be voided by the sheep, may fall upon the herbage, and there remain till they are eaten. Such is the supposition published by Mr King of Hammersmith, in the *Quarterly Journal of Agriculture*, No. XXXI. p. 331, in which, after showing the vast number of eggs which must fall upon the grass, he says, "We must cease to wonder that so many sheep die of rot; the miracle is, that every sheep does not die of it."! I cannot, however, for my part, see a miracle in the matter, for the simple reason, that the eggs of the entozoa are not capable of retaining their vitality when absent even for a very short time from

* To obtain the eggs of the fluke worm for examination, hold a saucer under the gall bladder, make an opening in it with scissors, and the bile containing the eggs will flow into the dish. Pick out any fluke worms that may be in the fluid, then dilute it with about twelve times its bulk of water, agitate for a few minutes, and filter. The eggs will be found in the corner of the filtering paper.

the place of their nativity, and therefore may be eaten with impunity.

II. Supposing the eggs to have reached the sheep's stomach in a condition to allow of their being hatched, they, according to popular voice, find their way into the gall bladder by one of two routes.

1. Mr King, the gentleman above spoken of, conjectures, in the same paper, that the fluke, after leaving the egg in the stomach of the sheep, *makes its way up the gall vessels*. This is, I am sorry to say, a very idle conjecture, as, from the valvular nature of the opening of the gall duct into the duodenum, an entrance from that intestine to the gall bladder is perfectly impracticable to any of the entozoa.*

2. The eggs are believed by a writer in the *Letters of the Bath Society of Agriculture*, for 1781, to be taken into the blood along with the chyle from the small intestines, and to be arrested in the liver by the secretory ducts. This, it must be clear to every one, is the most absurd of all the notions; for if a globule of blood, which we must suppose to be the largest body capable of being absorbed from the intestine, is only about $\frac{1}{3000}$ of an inch in diameter, how can the egg of a fluke worm pass through the same channel, when Mr King has, by careful observation, shown it to be $\frac{1}{300}$ of an inch in its shortest measurement. Again, allowing

* The notion that rot is occasioned by animalcules getting into the liver is not confined to this country. Leake, in his travels in the Morea, alludes to an opinion prevalent there, that the *vidhela* (rot) is caused by the sheep feeding in marshy places in August and September, when it is imagined that an insect from the plants finds its way into the biliary vessels.

that they are taken into the blood, would they not frequently be hatched there, and would they not also be found in other quarters besides the liver. But do we ever find them in the blood? Do we ever see them in other organs? Certainly not.

Not one of these theories would ever have been broached had their authors been aware of two important circumstances. 1. That M. Schreiber, the director of the Museum at Vienna, has proved that worms and their ova are not capable, under ordinary circumstances, of resisting the action of the digestive organs, and, therefore, that they cannot be introduced into the body by this channel. "During six months, he fed a pole-cat almost exclusively on various kinds of intestinal worms, and their eggs mixed up with milk; and on killing and examining it, at the end of this period, not a single worm of any kind was found in it."* The reader may perhaps object to this illustration, on the ground that there is so vast a difference between a sheep and a pole-cat, that a comparison in regard to their digestive habits cannot possibly hold good, but if he will turn to paragraph (96), he will see that the stomach of a sheep is as well fitted as that of a carnivorous quadruped for the digestion of animal matters. 2dly, The fluke worm has been found by Frommen in the foetus of the sheep, into which it could not have been conveyed by transmission from the mother, as there is no direct vascular communication between the foetal and maternal side.

From a consideration of all these data, the conclu-

* *Cyclopedia of Practical Medicine*, Vol. iv. p. 524.

sion must at once be drawn, that as living flukes cannot reach the liver from without, they must of a necessity be produced only in particular states of the animal they inhabit. How they originate we cannot of course determine, and this is not the place to hazard physiological conjectures; but it will be found that their appearance in the bile is always preceded by tuberculous deposits in the lungs or liver. This I have proved by numerous dissections, in which I have occasionally found tubercles without flukes, but never met with flukes where I did not at the same time discover tubercles. Fluke worms, therefore, can never be regarded as a cause of rot, they must be looked upon merely as a symptom. We cannot, however, say that tubercles give rise to the liver-fluke, for tubercles are often present in cases where flukes are absent; and if the latter were the effect of the former, their presence under such circumstances would in all probability be constant.

III. Particular plants have been said to cause rot, but the proofs of their evil tendencies being in every instance about as logically supported as the fluke theories already mentioned, I need not trouble myself or the reader by proceeding to details.

Real Causes of Rot. Everything that has a tendency to weaken the animal, will be more or less liable to lead to rot. Exposure to cold and wet, mishaps at lambing time, food bad in quality or deficient in quantity, and over-driving, will all predispose the constitution to the deposition of tubercles. It is from the

causes being in this way common to the whole flock, that contagious properties have been ascribed to rot, it having been observed, from the time of Virgil, to break out in many animals at once.*

The reason of so many different things having, from first to last, been reckoned capable of producing this disease, appears to lie in the known fact, that if a sheep be exposed to any of the above depressing agents, rot, if the animal be as yet untainted, will not, at the moment, shew itself; but a chain of morbid actions will in all probability then commence, and, being beyond the ken of ordinary observers, will pass unheeded, till some slight mismanagement in food or shelter, hastens their progress, and renders them apparent to the plainest understanding. The final symptoms of rot may thus occur on any kind of pasture, and the scene of the catastrophe will incur a stigma which ought to be attached to herbage which the sheep have consumed at some distant place or date.

Bad food is justly regarded as one of the most common causes of rot, and ranks, in my estimation, next to cold and wet, in its power of producing it. I shall only remark, on this point, that of all the food on which sheep can possibly be kept, none is known to act so deleteriously as grass which has sprouted quickly. Rot is well known to occur most frequently on land which has been irrigated during summer, for at this season

*“ Nor oftener are the floods disturb'd with wind
Than sheep with rots; nor doth the sickness find
One to destroy, but suddenly doth fall
On root and branch, stock and original.”

Virgil's Georgics, Lib. III.

any excess of moisture is peculiarly injurious to the economy of a plant.

When plants by heat and moisture are stimulated to increased exertion on a poor soil, they acquire bulk without having it in their power to obtain at the same time those saline matters which constitute a healthy plant, becoming in fact, to the eye of an inexperienced person, thriving vegetables, while to the palate they prove wersh and watery.

The same result may follow from a different process. The saline matter may not be taken up, even when the soil is rich in such ingredients, from the functional derangement into which the roots or digestive organs have been thrown by the unnatural circumstances in which it has been placed. A plant is composed, like all organized bodies, of a certain number of proximate principles, which are more or less numerous in different kinds. These are combined with varying quantities of potass, soda, lime, magnesia, and iron, which, though formerly supposed to be too trifling in quantity materially to affect the quality of the plant, have yet been recently and satisfactorily proved completely to change the character of the compound, even when the excess or deficiency amounts only to a $\frac{1}{100000}$ th part, so that, supposing an animal to thrive on plants which contain salts of any or all of the above bodies, it will soon fall off if these plants are in any way deprived of a single adjunct; for by the removal of that one salt, their nature has been entirely altered.

The certainty and rapidity with which Bakewell could rot his sheep, by pasturing them, in Autumn, on land over which water had been allowed to flow during

the previous summer, may seem to controvert what I have above stated, as to time and frequent change of pasture often intervening between the origin of the disease, and its termination; but when it is recollected that he pursued the destructive system of breeding *in* and *in*, of itself sufficient to induce a tuberculous predisposition, the reader will perceive that his sheep were, in all likelihood, more or less tainted, and therefore, sure to fall victims to the disease the moment they were subjected to the deleterious influence of an unwholesome pasture.*

Over-driving and hurrying of every kind, is, in my opinion, a fruitful source of rot, not only from the fatigue it causes, or the risk it leads to of taking cold, but also from the injury, which in many cases results, to the delicate texture of the lungs. As shown in the note to paragraph (157), no animal is more easily put out of breath by running, than the sheep. Whenever the breathing is hurried, the circulation through the lungs is quickened also. If the tissue of the lungs be in any way delicate, the force with which the blood is propelled is sure to make it yield, and in this manner the animal is often suffocated by the large quantity of blood, which issues into the air tubes at once from many points. Fig. 1, Plate VI. exhibits a good illustration of this taken from a sheep. Numerous red points are seen sprinkled over the surface of the section, indicating that blood has been effused from many minute

* When parcels of Mr Bakewell's best sheep became, from any defect, unserviceable to him, he used to fatten them for the butcher. But as there was a *probability* of their becoming valuable in other hands, he always gave them the rot before he sold them! An example, which, I hope, for the sake both of man and sheep, never to see followed.

torn vessels. Now, if this animal had survived, each speck of blood would have formed a centre, round which tuberculous matter, as in fig. 2, Plate VI. would have been secreted, and death from rot, at some ulterior period, would, in all probability, have been the result.*

(165.) *Treatment of Rot.* As reason and experience have taught us that tathy herbage is a common cause of this complaint, we should, when it shows itself, at once remove the animals to a better pasture, where they should be exempted from teasing of every kind.

Salt appears, after every trial, to be the best medicine, and to this they should have, at all times, ready access. Should the disease be rather far advanced, the breathing hurried, and the cough annoying, occasional doses of the following infusion will be of service, in enabling the farmer to keep down the disease, till such time as he can conveniently dispose of the animal.

Take of Leaves of Foxglove two ounces,

Boiling water two English pints :

pour the water on the leaves, cover up the vessel, and keep it in a warm place for six or eight hours, then strain.

Two tea-spoonfuls morning and evening may be given to a sheep, but as the plant is an active poison, and the strength of its infusion liable to vary, a couple of days should always intervene between every six doses.

About the year 1800, a notion prevailed in this

* Pathologists differ as to whether tubercle is the cause or consequence of *hemoptysis*, as this effusion of blood into the tissue of the lungs is termed. Andral, however, is decidedly of opinion that *hemoptysis* is one of the exciting causes, and, in domestic animals, I believe it to precede tubercle more frequently than is generally imagined.

country, that an effectual remedy for rot had been discovered by the Dutch, but this was quite unfounded, no cure ever having been hit upon for this sweeping malady ; indeed, a cure is fairly out of the question : its prevention and palliation, but not its eradication, being all that we can hope for. Sundry plausible plans of treatment have, however, at one time or another been contrived, some of them, in all conscience, harmless enough, but others again as well adapted for the destruction of the animal, as the removal of the disease.

As fluke worms have usually been reckoned the cause of rot, so the treatment has principally consisted in attempts to effect their extermination. With this view, Sir George Steuart Mackenzie of Coule, in defiance of all preconceived medical opinion, advocated, in his work on *Sheep*, published in 1809, the employment of mercury to stay the progress of rot, and in the same work, or one very like it, as lately published anonymously by the Society for the Diffusion of Useful Knowledge, under the title of the *Mountain Shepherd's Manual*, the utility of this dangerous procedure is as firmly maintained. At the same time Sir George, though rather in the dark as to the real nature of the disease, admits, in both editions, that tubercles exist in rot, especially in the lungs. Now, if he had inquired of any medical person what drug ought, when tubercles are present, of all others to be avoided, he would have found that medicine to be mercury. The administration of it therefore in rot, no matter what may be the form or mode in which it is exhibited, will to a certainty aggravate the symptoms, and shorten life. If, for the sake of doing something, you will endeavour to remove

the worms, Chabert's animal oil will be found a safe and efficacious remedy ; but, if my opinion can have any weight, I would recommend the farmer to allow them to remain.

Sheep, when displaying symptoms of rot, should always be kept dry and warm. If they must be retained throughout the winter, good sound solid food, such as well made hay or oats, should be afforded them, and the shelter of a straw yard should if possible be obtained. A liberal supply of salt should be given with all their provender ; and if they do not seem to relish it, give them occasionally a small quantity in water as a drench.

(166.) *Prevention of Rot.* On this head I need do little more than remark that attention to the causes will go a great way to point out the necessary means for its prevention. Admission of the sheep to rank soft grass, heavy stocking, short allowance of food during winter, every thing in fact which leads to the exposure of the animal should be scrupulously avoided. The strongest constitution cannot with impunity be tampered with, and the soundest habit will fall before the mining attacks of want and weather. Keep your stock always in as high health as possible, for such is the surest prevention of tuberculous disease.

As rot is hereditary,* the importance of weeding out ewes from the flock on their first exhibiting appearances of unsoundness, is acknowledged by all. Many ways have been pointed out for detecting the incipient symptoms, but none plainer and better than those written

* M.M. Dupuy and Andral have seen tubercles in the fœtus of the sheep.

by the late Mr Beattie of Muckledale, and published in the 3d vol. of the *Highland Society's Transactions*. "The first thing to be observed," says Mr Beattie, "is in the spring, when they are dropping their lambs. A sound ewe, in good order, drops a lamb covered with a thick and yellow slime, which the ewe licks off it, and the rule is, the sounder and the higher the condition the ewe is in, the darker and thicker will be the slime; but when they observe a ewe drop a lamb covered with thin watery bubbles, and very white, they note her down as unsound."

"About the month of September, when they intend to dispose of their draught ewes, they put all their sheep into a fold, and draw them by the hand, that is, they catch them all, viz. the ewes they design to sell any of, and clapping their hand upon the small of the back, they rub the flesh backwards and forwards between their fingers and thumb and the ends of the short ribs: if the flesh be solid and firm, they consider her as sound; if they find it soft and flabby, and if, when they rub it against the short ribs, it ripples, as we term it, that is, a sort of crackling is perceived, as if there were water or blubber in it, they are certain she is unsound. This is the most certain of all symptoms, but is not to be discerned with any degree of certainty but by an experienced hand; for although, as I have here related it, it seems a very simple affair, and easily acquired, yet it is well known that many shepherds, who have followed sheep all their lives, never arrived at any thing like certainty in judging by the hand, whilst men of superior skill will seldom be mistaken, and will draw by no other rule. Yet still it must be acknowledged that

the best plan is to bleed largely, and give two or three smart doses of Epsom salts. When it occurs in young lambs, sweet spirit of nitre, given in the quantity of a tea-spoonful twice a-day, is found to be attended with the happiest effects. Tapping, or, as it is popularly termed, *stabbing*, or *sticking*, to permit the escape of the water, is the cure resorted to in South Africa, when it appears in old sheep, after exposure to rain ; but this ought never to be resorted to unless under the guidance of a medical person. It would be much better at once to kill the sheep.

(169.) *Sturdy*. As shown in the tabular view of the diseases, in foot-note to paragraph (121), this affection may be the result either of pressure on the brain from an animal growth, or from the accumulation of a fluid. Serum is in both cases the mechanical cause of the symptoms, but in the former it is eliminated from neighbouring parts by a hydatid, while in the latter it is merely deposited in some of the natural cavities (the ventricles) of the brain, owing to a congested state of the spinal marrow, the result of continued cold upon the back.

Figure 2, Plate VII., taken from Rudolphi, exhibits a view of the animal which gives rise to the first variety of sturdy. It is the many-headed hydatid of the brain, *Cœnurus Cerebralis* of naturalists. Like the *Cysticercus tenuicollis*, already described under the head of Rot, it consists of a thin membranous cyst, full or otherwise of serous fluid ; but, unlike the aforementioned animal is studded over with groups of little velvety appendages or heads, each of which has a series of barbs projecting round the mouth. Figure 2, *a*,

Plate VII., is a highly magnified representation of two of these heads.

A good idea of the hydatid, as it exists in the sheep, may be derived from an inspection of Fig 1. Pl. VIII., which has been engraved from a sketch kindly furnished to me by my friend Dr Kirk of Deal. Fig. 1 represents the brain of a sheep two years old, which has been affected with sturdy. The right lobe, *a*, of the cerebellum or lesser brain, is much distended with fluid, which is enclosed in a membranous bag, as shown at *b*, where an incision has been made to expose it, and at *c*, where it is shining through one of the coverings of the brain, the pia mater.

The hydatid is found of all sizes, from that of a pea to that of Fig. 2, Plate VII. Large ones are far from rare, and the ventricle is frequently enormously distended. The hydatid in the brain from which Fig. 2, Plate VIII. was taken, though not filled to repletion, contained ten drachms of serum. The ventricle was consequently much dilated, as shown at *a* in that figure, and the usual course and size of the convolutions completely altered. Instead of being folded, like the intestines, upon themselves, they proceeded, as seen at *b b*, from back to front of the brain; while the furrows between them, which are, in the healthy animal, usually too shallow to be measured, were in several places as deep as the length of the lines at *c d*.

This excessive accumulation of fluid within the brain leads, as might be expected, to the dilatation of the skull, and to the absorption of its walls, when the bones, young though the animal be when affected with sturdy, can no longer be made to yield. For this reason the

skull, towards the termination of the disease, generally becomes thin and soft in front of the root of the horn, and in this way offers a spot which, from its being easily pierced, is frequently made the seat of surgical operations. Other parts of the skull also undergo considerable thinning, more so indeed than in front of the horn. The attention of the farmer has hardly, if ever, been called to this fact, though I believe that, for one instance in which perforation occurs in the frontal bone, it will be noticed a score of times on the sides of the head. In a head with which I was favoured by Mr Grieve, Branzholm braes, each temple, exactly beneath the superior extremity of the upright branch of the lower jaw, displayed a circular opening entirely through the bone, wide enough to permit the passage of an ounce bullet.

Whatever may produce pressure on the brain, the symptoms which indicate it are nearly always the same. The sheep has a dull, stupid look, turns very often round and round, and will, when water is in its way, stand staring at it till at last, giddy and confused, it plumps fairly in. If, when the symptoms are very unpromising, convulsive movements should occur, they may be taken as a favourable sign, as they indicate a diminution of the pressure on the brain. A minute description of the morbid appearances in hydrocephalus could serve no good purpose, I therefore pass on to the prevention of sturdy.

(170.) *Treatment and Prevention of Sturdy.* The variety caused by hydatids can only be prevented by the use of dry, well grown, wholesome food. Dr Jenner found that he could cause hydatids to form in rabbits at

will, by feeding them on green succulent provision ; and it is well known that this form of sturdy prevails among sheep chiefly in marshy places, as the fens of Lincolnshire.

Water in the head is generally induced, as first pointed out by the Ettrick Shepherd, in the *Farmer's Magazine* for 1812, by the back of the animal being chilled, as is evident from the following facts :—

“ 1. It is always most general after a windy and sleety winter.

“ 2. It is always most destructive on farms that are ill-sheltered, and on which the sheep are most exposed to those blasts and showers.

“ 3. It preys only on sheep rising their first year, the wool of which separates above, leaving the back quite exposed to the wet and cold.

“ 4. If a piece of cloth or hide is sewed to the wool, so as to cover the back, such a sheep will not be affected with the disease.”

Bratting is therefore the best preventive, and it is as cheap as it is effectual. One pair of old blankets, worth only some four or five shillings, will furnish coverings for forty hogs, and if laid carefully aside in spring, they will continue serviceable for two or three years. An operation can avail nothing—slaughtering the sheep is therefore the only expedient.

When the existence of a hydatid near the surface of the brain is denoted by the skull yielding, at some particular spot, to the firm pressure of the thumb, its extraction must be set about in the manner described in paragraph (118), where I have also given my objections to the common modes of operating.

(181.) *Trembling.* Several affections are included under the name of *trembling* or *leaping-ill*, all having, in common, more or less of the symptoms which these names denote. They may be considered as arising from exposure to cold and damp, especially on long fatiguing journies, as in bringing sheep from the Highlands to the south of Scotland, when it frequently prevails to so great an extent, on reaching the low country, as to oblige the shepherd to leave eight or ten behind him at every stage. Injuries of the loins, either inflicted by themselves in jumping and running, or by others from rough usage in the fold, are common causes of the disease; but in this variety the hind quarters only are powerless. Another species is owing to oppression of the brain from congestion, in this way resembling incipient sturdy, and occurring only in very fat sheep.

(172.) *Treatment of Trembling.* The first variety is best met by rest, shelter, and a supply of nutritious food; but as the animal is incapable, in many cases, of collecting it, the shepherd must lift it from one rich part of the field to another, so soon as it has cleared away the grass within its reach. In the second kind, as caused by accident, the sheep must be slaughtered, as, should a cure be attempted, the treatment will be too tedious and complicated to succeed in ordinary hands. Copious blood-letting, and doses of Epsom salts, will be found of most advantage in the third species; but if the sheep can be disposed of so much the better, as this kind of *trembling* is almost certain, unless combated by energetic depletion, to end in sturdy.

(173.) *Wood Evil* is nothing more than a cramp of

the hind legs, owing to water dripping upon them from trees after a shower of rain, and is best treated by enveloping them in flannel, wrung out of hot water; but if the sheep is at the time very chill, gentle friction must first be used, else dangerous consequences will ensue. Rubbing with warm turpentine has been recommended, and is apparently worthy of a trial.

(174.) *Inflamed Eyes.* The pollen of flowers getting into the eyes while feeding, is a common cause of this annoyance, which need not be described, as, from being visible, it is known to all. Examine the eyes, and remove any irritating body. Then, if the disease be of recent date, bleed the animal largely from the jugular vein, and give it several doses of Epsom, or Glauber's salt. After the inflammation is subdued, or should it be in the suppurating stage when first noticed, hold the lids asunder, and drop upon the eye, three or four times a day, a solution of white vitriol, five grains to the ounce of water. Where this cannot be had, pure cold water dashed against the eyes and head several times a day will serve as a substitute.

Though sheep are not so much incommoded by blindness as other animals, from the instinctive care usually taken of the sufferer by the rest of the flock, still such a mishap should always be prevented by energetic treatment at the commencement of the symptoms.

(175.) *Soft Cancer of the Eye*, or, as it is also called by medical men, *Fungus Hematodes*, is of very rare occurrence among sheep, and indeed would not have deserved a notice here, were it not that, from being a malignant disease, it might be looked upon as

quite incurable. I can only describe it as a soft, spongy tumour, rising from the bottom of the eye, involving all the textures of that organ, so as to render them scarcely recognizable, and bleeding on the slightest touch. It is readily removed by passing a stout thread through the front of the eye with a needle, so as to afford the operator a hold by which to pull it outwards with the left hand, while, with the right, he cuts round it with a narrow-bladed knife. The operation is attended only with slight pain, but must not be considered the sole curative means; the sheep must have, at the same time, a frequent change of pasture, to prevent a recurrence of the tumour.

There is a very large tumour of this description at present in the museum of Guy's Hospital, taken from a sheep which recovered perfectly.

THE END.

GLASGOW :

Edward Khull, Printer to the University.

PLATE I

Fig 1



Fig 4



Fig 2



Fig 5



Fig 3

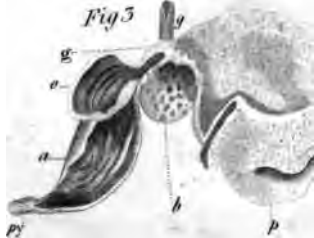


Fig 6





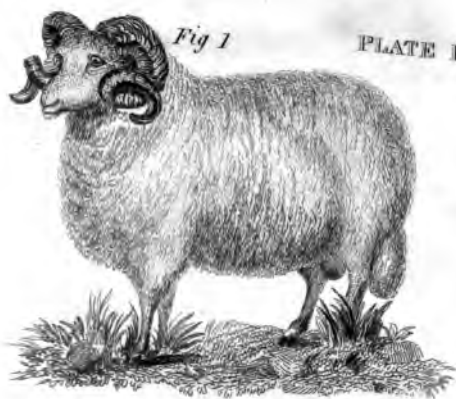




PLATE III

Fig 1

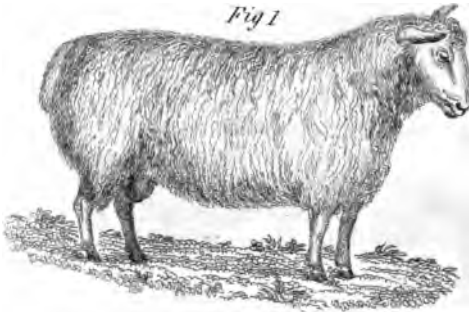


Fig 2



Fig 3





PLATE IV





PLATE V

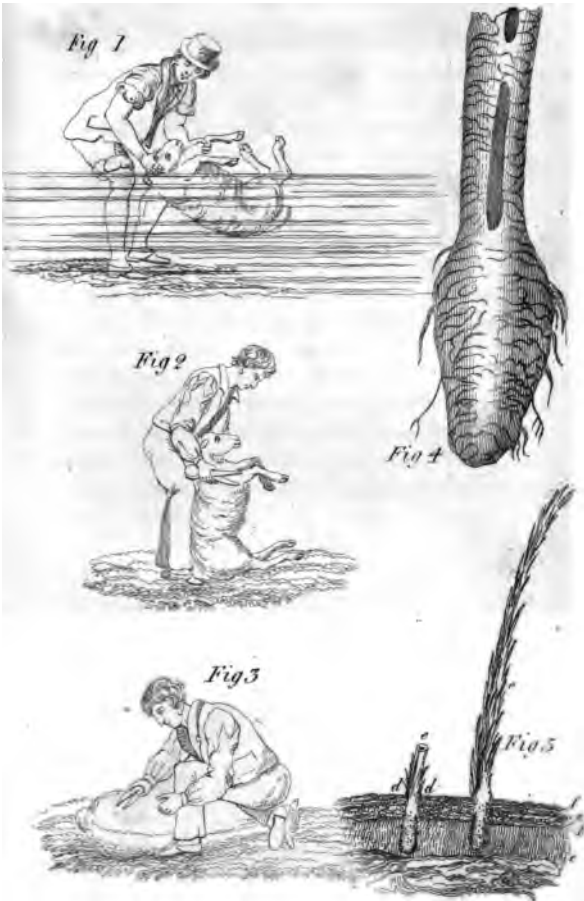




PLATE VII

Fig 2 a



Fig 1 a



Fig 3



Fig 2

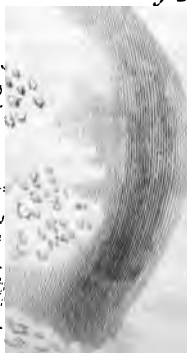
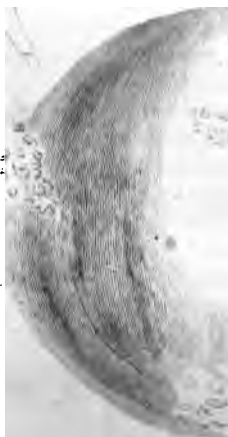




Fig 1

PLA

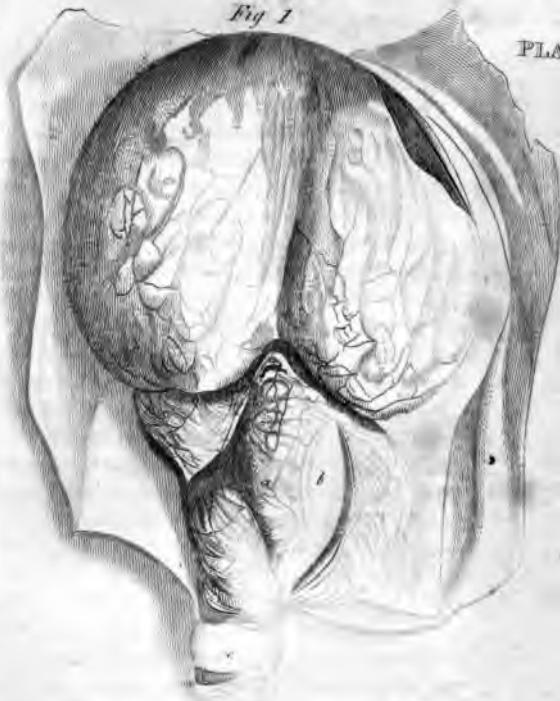


Fig 2

c d





